

## APPENDIX G. FLOOD HAZARD MANAGEMENT RISK AREAS

This appendix contains a complete listing of the flooding and erosion related risk areas identified by the River and Floodplain Management Program staff during the preparation of the 2006 King County Flood Hazard Management Plan. The approach to identifying and characterizing these risk areas varied from river to river and was influenced by both the characteristics of each river, and by the professional judgment of the team compiling this information. This risk identification was the first step in the development of project and program proposals contained in Appendices E and F of this Plan. These project and program recommendation are cross referenced in the last columns of this table. In many cases the magnitude of these risks described is not well understood but will be further evaluated through future technical studies and risk assessments.

### South Fork Skykomish River, Miller River, Maloney Creek, Tye River and Anthracite Creek (WRIA 7)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.4	19.9	L, R	<b>South Fork Skykomish River Channel Migration Zone Study and Map:</b> Channel migration is a type of flood hazard. King County maps channel migration zones to identify the extent of this flood hazard and regulate land use in the affected areas. Historical and recent evidence indicates that this part of the South Fork Skykomish River is subject to channel migration. A South Fork Skykomish River channel migration zone study and map will be completed under this project for use by the King County Department of Development and Environmental Services in land use regulation within King County. (Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish Channel Migration Zone:</b> Conduct South Fork Skykomish River Channel Migration Zone Study and Mapping. (Skykomish River, Unincorporated)
7.8	7.8	L	<b>Parcel Number 7809400070:</b> This existing home has repeatedly experienced damage from flood events. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to, repetitive loss properties. (South Fork Skykomish River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.8	7.8	L	<b>Parcel Number 7809400090:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to, repetitive loss properties... (South Fork Skykomish River, Unincorporated)
7.8	7.8	L	<b>Parcel Number 7809400100:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (South Fork Skykomish River, Unincorporated)
7.9	7.9	L	<b>Parcel Number 7809300140:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (South Fork Skykomish River, Unincorporated)
7.9	7.9	L	<b>Parcel Number: 7809400160:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (South Fork Skykomish River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
8.9	8.9	R	<b>Parcel Number: 7349800250:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (South Fork Skykomish River, Unincorporated)
17.5	17.5	L	<b>Parcel Number 2526119037:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (South Fork Skykomish River, Unincorporated)	Y	<b>South Fork Skykomish River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (South Fork Skykomish River, Unincorporated)
7.1	7.4	R	<b>Montagna Park:</b> The upstream end of NE 196th Street has been undermined by severe bank erosion during moderate flooding. Emergency revetment construction did not achieve a slope that will be stable over the long term. Both the road and one residence are at risk from this erosion problem. Several homes and nonresidential structures exist in both the floodplain and floodway; many were built after 1993. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
7.4	7.6	R	<b>Chamonix:</b> Bank erosion threatens several homes built very near the edge of the river bank. A revetment of large rock riprap has slowed, but has not halted, this erosion. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
7.5	7.9	L	<b>Skylandia:</b> Existing homes have been inundated by fast-moving flood waters. Erosion and deposition damages are locally severe. Residential damages included structural problems as high-velocity waters shifted homes on their foundations. Flood study shows 100-year depths as great as 8 feet at these homes. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.8	8.0	R	<b>Skyko Park:</b> Several residential erosion problems have been patched with revetments and rockeries that are not showing recent damages but remain susceptible to extreme flood flow. Several homes and nonresidential structures exist in both the floodplain and floodway; it appears some were built after 1993. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
8.1	8.9	R	<b>Riverwood Park:</b> Several residential erosion problems have been patched with revetments and rockeries that are not showing recent damages but remain susceptible to extreme flood flow. Several homes and nonresidential structures exist in both the floodplain and floodway; it appears some were built after 1993. Flood study shows 100-year depths of 3 to 6 feet through most of this large subdivision. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
7.9	8.4	L	<b>Baring Left:</b> Severe channel erosion problems have been evident in this area, especially near the south end of 639th Ave NE, where one home was nearly undermined and perched over a tall vertical erosion scar that has been patched with concrete revetments. Although such revetments and rockeries are not showing recent damages, they remain susceptible to extreme flood flow. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
10.8	12.2	R	<b>Grotto:</b> Extensive fill restricts natural floodplain conveyance and storage functions. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
12.6	13.2	L, R	<b>Money Creek:</b> Logs and debris are jammed against the piers of the Miller River Road bridge over the South Fork Skykomish River at the Money Creek Campground. Downstream of the bridge, severe bank erosion has claimed residential property but does not imminently threaten residences. Further upstream, overbank flows were concentrated along the riverward side of the BNSF Railway grade. Where these concentrated flows hit the Miller River Road, they exceeded culvert capacity and damaged the road where they overtopped it. Further damages occurred as these flows split and continued, generally westward, overbank. A northwest split scoured both the railroad grade and the adjacent portions of the Money Creek Campground. A southwest split scoured through commercial and industrial property on its way to the Money Creek channel. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.
0.2	0.3	L	<b>Miller River Road Protection:</b> The Old Cascade Highway crossed the Miller River near its confluence with the Skykomish River. The left bank (west) road approach is at a relatively low elevation across the Miller River's broad alluvial fan. The highway has been severely damaged in past floods. Structural improvements have strengthened the road, but it remains at risk to channel migration on the fan. From a flood hazard standpoint, the ideal solution would be to relocate the Old Cascade Highway to a more stable location away from the alluvial fan. However, this does not appear to be feasible in the near term. (Miller River, Unincorporated)	Y	<b>Miller River Road Protection:</b> Supplement and extend the existing log crib that helps to direct flow toward the Miller River bridge. (Miller River, Unincorporated)
0.00	0.07	L	<b>Miller River Neighborhood Flooding:</b> The Old Cascade Highway crosses the Miller River near its confluence with the Skykomish River. The left bank (west) road approach is at a relatively low elevation across the Miller River's broad alluvial fan. Flood Flows across this road threaten homes downstream of the Miller River Road. (Miller River, Unincorporated)	Y	<b>Miller River Home Buyout:</b> Remove homes from hazard area. (Miller River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.4	0.6	L	<b>Miller River Curve Levee:</b> The existing levee along former Miller River channel protects against avulsion into remnant channels on the river's alluvial fan. The upstream end of this levee is subject to flanking, and the levee itself frequently overtops, so this protection is not complete. Even so, the levee restricts the natural processes of deposition and channel change, and limits the potential for fish use of several overbank channels. (Miller River, Unincorporated)	N	Feasibility and technical analysis required.
0.9	1.0	L	<b>Upper Miller River Levee:</b> Existing levee along Miller River channel protects against avulsion into remnant channel on the river's alluvial fan. The downstream end of this levee has been shortened by erosion that may compromise its protection to the downstream remnant channel and the adjoining public road. The levee also restricts the natural process of deposition and channel change, and it limits the potential for fish use of the former river channel. (Miller River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.0	0.4	L, R	<b>Maloney Creek:</b> Sediment and debris flows in Maloney Creek frequently plug its narrow channel and cause flow diversion into the Town of Skykomish. The Thanksgiving 1990 flood was no exception. Debris plugged the channel, sending flood flows through the U.S. Forest Service compound and the residential and commercial properties to the west. Emergency excavation by U.S. Forest Service crews kept the low flows in their accustomed channel, but left side-cast levees that limit that channel's capacity. This problem has a long history. The Town appears to be built upon the Maloney Creek alluvial fan, and much effort has been spent keeping the fan reasonably dry. Residents report that historic Maloney Creek blowouts sent flows down both 2nd Street and 3rd Street. Remnants of enormous log crib walls testify to the efforts required to stop those flows. Further downstream, large rock riprap lends similar protection to the shorter banks along the Forest Service compound. Aggradation problems continue downstream as far as the Old Cascade Highway, where the flow capacity under the bridge appears to have been limited by sedimentation within the channel. In the past, maintenance crews for the U.S. Forest Service, the Washington State Department of Transportation, and King County have informally taken turns dredging Maloney Creek sediments. (Maloney Creek, Unincorporated)	N	Feasibility and technical analysis required.
15.3	15.7	L	<b>Milltown:</b> Homes in old Milltown neighborhood west of Skykomish are subject to inundation by the river and by local drainage. (South Fork Skykomish River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.9	16.1	L	<b>Lower Town:</b> Most of Skykomish is within the 100-year floodplain; much of it is also within the one-foot floodway. A training levee follows the left bank of the river downstream of the 5th Street N bridge. This levee does not provide containment as it does not tie to high ground at its downstream end, just upstream of where Maloney Creek enters the river. It does tend to reduce the speed of deep flood waters in the school and residential neighborhood behind the levee. Flood study shows depths of 3 to 8 feet near homes in that area. (South Fork Skykomish River, Unincorporated)	Y	<b>Town of Skykomish Home Buyouts:</b> Remove homes. (South Fork Skykomish River, Unincorporated)
16.1	16.5	L	<b>Upper Town:</b> High-velocity flows can overtop the tall bank, flooding both homes and businesses. Structural damage has resulted when homes have been struck by fast-moving flood debris. Extensive bank erosion has been a recurring problem. The flood study shows 100-year depths of 3 to 6 feet at homes. (South Fork Skykomish River, City of Skykomish)	Y	<b>Town of Skykomish Home Buyouts:</b> Remove homes. (South Fork Skykomish River, City of Skykomish)
17.2	17.9	L	<b>Riverview:</b> Eight homes along the left-bank of the Tye River (looking downstream) were damaged by erosion and inundation. Severe erosion continues to threaten several of these homes, and all but one are subject to inundation damages when overbank flows cross the Riverview point. Flood study shows depths of 5 to 8 feet near these homes, and all are within the one-foot floodway. (Tye River, Unincorporated)	N	Feasibility and technical analysis required.
18.3	18.4	L	<b>Timber Lane Village Reach of Anthracite Creek:</b> Sediment and debris flows in Anthracite Creek frequently plug its narrow channel. This sends flows over the Stevens Pass Highway (SR 2) and through Timber Lane Village. This damage area includes a private road, an extension of NE 122 <sup>nd</sup> Street, and the community's potable water supply watershed and pump station. (Anthracite Creek, Unincorporated)	N	Feasibility and technical analysis required.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
18.2	19.1	L	<b>Timber Lane Village on Tye River:</b> This community of roughly 50 homes is built on the left bank of the Tye River (looking downstream), inside a gentle bend. Roughly one third of the community is on a high terrace and generally escaped Thanksgiving 1990 flood damage. Of the other two thirds of the community, the upstream portion is separated from the river by a large, vegetated left-bank point bar. Downstream of this left-bank bar, bank erosion has completely destroyed one home and threatens several others. This erosion is most severe immediately across from a right-bank bar that has formed below a tall scarp on the valley wall. Numerous vertical rockeries and a few sloped revetments have been built to stabilize these banks but none appear to provide reliable protection against extreme flood scour. Farther downstream, the residences were low enough to be inundated by fast-moving flood waters. Sand was deposited to a depth of three feet against one home. Another home was pushed off its foundation but has since been repaired and elevated. Flood study shows 100-year depths of 3 to 6 feet in these homes. (Tye River, Unincorporated)	Y	<b>Timberlane Village Home Buyouts (Erosion and Flooding):</b> Remove homes. (Tye River, Unincorporated)
21.4	22.1	L	<b>Profitts Pond:</b> High-velocity inundation is likely for two residences situated on very large lots. Because there is a large log jam in main channel, channel migration is likely; an avulsion path is very near these homes. (Tye River, Unincorporated)	N	Feasibility and technical analysis required.

### Upper Snoqualmie River, Kimball Creek and Coal Creek (WRIA 7)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.0	3.0	L, R	<b>Kimball Creek Flooding:</b> Backwatering of Kimball Creek from the Snoqualmie River frequently results in the flooding of homes and roads in the Kimball Creek floodplain. Flood water from the South Fork of the Snoqualmie River overflows toward this area during extreme events. Road crossings and other obstructions may exacerbate this problem by limiting flow capacity. (Kimball Creek, Unincorporated, City of Snoqualmie)	N	Feasibility and technical analysis required.
0.0	0.5	L, R	<b>Coal Creek Sediment Deposition and Channel Migration:</b> Sediment from Coal Creek creates a delta at the confluence of Coal Creek and the much slower Kimball Creek resulting in frequent channel changes and undermining of one house. (Coal Creek, Unincorporated)	N	Feasibility and technical analysis required.
40.0	42.0	L	<b>Neighborhood Flooding in Snoqualmie Area:</b> More than 600 homes and hundreds of other structures are subject to flood inundation in and around the City of Snoqualmie. Recent projects have reduced the frequency and severity of local flood conditions, but the area continues to be at risk. (Upper Snoqualmie River, City of Snoqualmie)	N	<b>City of Snoqualmie Natural Area Acquisitions:</b> This project is to acquire property along the Snoqualmie River for shoreline, floodplain and native habitat protection. The project would acquire flood-prone land and eliminate flood risk to one home. (Upper Snoqualmie River, City of Snoqualmie)
40.8	40.9	L	<b>Sandy Cove Park Erosion:</b> Sandy Cove Park adjoins the Snoqualmie River in the City of Snoqualmie. Several feet of the park's eastern boundary have been lost to river erosion. The process has exposed a tall vertical bank of relatively loose material along the edge of this small urban park. Users could fall in the river and could have trouble getting out. (Upper Snoqualmie River, City of Snoqualmie)	N	<b>Sandy Cove Park Restoration:</b> The project would restore approximately 200 feet of riparian and floodplain habitat along the mainstem of the upper Snoqualmie. It would also place a large bioengineered log structure along the bank to reduce the risk of erosion damage to a public park. (Upper Snoqualmie River, City of Snoqualmie)
0.7	1.1	R	<b>Three Forks Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a levee or revetment maintenance need. (Upper Snoqualmie River, Unincorporated)	N	<b>Three Forks Natural Area Restoration:</b> The project would provide vegetation maintenance of Upper Norman Levee (to be planted) by removing non-native plants and replant 35 acres of formerly grazed lands. (Upper Snoqualmie River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
42.0	42.8	R	<b>Mill Pond Road Flooding and Flood Damage:</b> Frequent overbank flooding results in damage to the road shoulders and debris accumulations on the road. Flooding in this area has also damaged facilities at the privately owned mill. Mill pond road is also within the channel migration zone in this area. In addition, most of Mill Pond Road lies within or adjacent to the channel migration zone. (Upper Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
42.5	44.2	R	<b>Reinig Road Erosion and Neighborhood Flooding:</b> A 1.8 mile segment of Reinig Road borders the channel migration zone and in one location has been damaged to the point that an emergency repair was required. Five homes along this road segment are also subject to flooding and erosion. (Upper Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
2.6	2.8	L	<b>South Fork Avenue SW and Shamrock Park Flooding:</b> Levee overtopping, seepage, and poor local drainage have caused, and will continue to cause, flooding landward of the Reif Road levee. (South Fork Snoqualmie River, Unincorporated)	Y	<b>North Bend Area Residential Flood Mitigation:</b> Relocate or elevate individual structures to eliminate the associated risk of flood damage. (South Fork Snoqualmie River, Unincorporated, City of North Bend)
2.0	7.0	L, R	<b>South Fork Levee Conditions:</b> Extensive geotechnical deficiencies have been observed on the existing levee system along both banks of the South Fork Snoqualmie River through North Bend and the surrounding unincorporated areas. These problems can compromise the flood protection benefits of the levee system. (South Fork Snoqualmie River, Unincorporated)	Y	<b>South Fork Levee System Improvements:</b> Rebuild and strengthen selected portions of the existing levee system in a manner that maintains current preferential protection of the more heavily developed parts of the City of North Bend. (South Fork Snoqualmie River, Unincorporated)
5.6	6.2	L, R	<b>Riverbend Flooding and Erosion:</b> A manually-adjustable flood gate that separates the South Fork Snoqualmie River from a private lake can allow floodwater to enter the lake, increasing water surface elevations and causing flood damage to homes around the lake. Flood waters in this constricted reach also cause erosion problems on the right bank. (South Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
8.5	9.2	L, R	<b>Edgewick Area Flooding:</b> Flooding along this steep reach affects homes on both banks of the river in this reach. The left bank abutment of the Edgewick Road Bridge encroaches sharply into the channel and is subject to erosion. (South Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
44.2	44.4	R	<b>Reinig Road Slope Instability:</b> Road bank failure at this location at which the river make a nearly 90 degree bend has been repaired by King County Roads. Continuing erosion at the revetment's shallow toe is likely to undermine this repair. Upstream and downstream banks are unprotected, leaving the road at risk from future erosion damage in these areas as well. (Upper Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
43.6	44.2	R	<b>Reinig Road Erosion across from Confluence with South Fork:</b> Right bank erosion at the confluence of the South Fork and the mainstem Snoqualmie may damage Reinig Road in this location. (Upper Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
45.0	45.6	L, R	<b>Upper Norman Flooding, Erosion and Habitat Degradation:</b> Channel aggradation and changes in the thalweg have contributed to damage to two river facilities in this constrained reach. The status of these two facilities with respect to the need to maintain is rather ambiguous. One home on the right bank is subject to both flood and, in the long term, channel migration. The Upper Norman flood protection facility effectively isolates a fish bearing wetland from the mainstem of the river except during extreme high flows. Both facilities inhibit natural riverine process and are largely devoid of native vegetation. (Middle Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
46.0	47.0	L	<b>Middle Fork Levee Conditions:</b> Channel constriction and bed aggradation caused by two existing levees currently exacerbate flood flows through high flow channels in northeast North Bend, resulting in damage to local streets and causing some residential flooding. Both facilities inhibit natural riverine process and are largely devoid of native vegetation. (Middle Fork Snoqualmie River, Unincorporated, City of North Bend)	Y	<b>Middle Fork Levee System Capacity Improvements:</b> Shorten or realign the downstream ends of the existing levee segments to improve the flow capacity along the river channel. (Middle Fork Snoqualmie River, Unincorporated, City of North Bend)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.5	3.5	L, R	<b>North Bend Area Residential Flooding:</b> Although a system of levees generally protects most homes in the North Bend area from damage during minor floods, the capacity of the levee system is limited. Flows in excess of roughly 20-year magnitude will overtop portions of the levee system and cause damage to the neighboring properties. Hazards are associated with both the Middle Fork Snoqualmie River and the South Fork Snoqualmie River, as well as several smaller tributary streams. (Middle Fork Snoqualmie River, Unincorporated, City of North Bend)	Y	<b>North Bend Area Residential Flood Mitigation:</b> Relocate or elevate individual structures to eliminate the associated risk of flood damage. (Middle Fork Snoqualmie River, Unincorporated, City of North Bend)
47.5	47.8	L, R	<b>Mt Si Bridge Revetment Erosion:</b> Extreme high flows could result in damage to the revetments on both banks adjacent to the Mt. Si Bridge. (Middle Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
48.6	49.1	L	<b>Tanner Revetment Erosion:</b> Extreme high flows could result in damage to the Tanner revetment which protects the intersection of SE Tanner Road and North Bend Way. (Middle Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
49.2	49.5	L	<b>Tanner Neighborhood Erosion:</b> Bank erosion threatens several residential properties both upstream of the Tanner revetment. (Middle Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
1.0	2.0	R	<b>Schodde Revetment and Ernie's Grove Residential Property Erosion and Flooding:</b> Reoccupation of the side channel running along the base of the Schodde revetment would likely result in damage to private property. (North Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
0.5	2.2	L	<b>Moon Valley Residential and Road (sole access) Flooding:</b> Inundation of residential properties and public and private roads and fast-moving water on Moon Valley Road completely isolates this community during moderate and extreme flood events. (North Fork Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.

**Lower Snoqualmie River and Tokul Creek (WRIA 7)**

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.0	7.0	L	<b>Parcel Number 0626079010:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
9.5	9.5	L	<b>Parcel Number 1226069019:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
10.0	10.0	L	<b>Parcel Number 1426069004:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
22.4	22.4	R	<b>Parcel Number 0925079025:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
23.4	23.4	R	<b>Parcel Number 8656300195:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
25.5	25.5	L	<b>Parcel Number 2925079019:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
26.0	26.0	L	<b>Parcel Number 2825079011:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
30.0	30.0	L	<b>Parcel Number 3325079029:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
30.5	30.5	L	<b>Parcel Number 0424079028:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
33.2	33.2	L	<b>Parcel Number 0924079012:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Lower Snoqualmie River, Unincorporated)	Y	<b>Lower Snoqualmie River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Lower Snoqualmie River, Unincorporated)
TBD	TBD	TBD	<b>Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a levee or revetment maintenance need. (Lower Snoqualmie River, Unincorporated)	N	<b>Lower Snoqualmie Restoration and Maintenance:</b> Revegetation of existing levees or revetments to reduce cost of flood risk reduction. Includes enhancement of 3 miles of riparian habitat, improve access to off-channel habitat, open 1.5 miles of rearing habitat by removing blockages and restore a three-acre wetland. (Lower Snoqualmie River, Unincorporated)
TBD	TBD	TBD	<b>Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a levee or revetment maintenance need. (Lower Snoqualmie River, Unincorporated)	N	<b>Snoqualmie River Restoration on Agriculture Lands:</b> Revegetation of existing levees or revetments to reduce cost of flood risk reduction. The goal is to plant 50 acres of floodplain habitat throughout the Snoqualmie. (Lower Snoqualmie River, Unincorporated)



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.0	0.4	L, R	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Cherry Creek Mouth Restoration:</b> Revegetation of existing levees or revetments to reduce cost of flood risk reduction. This project would restore the old channel alignment, circa 1960, before it was straightened and channelized. This would create approximately 2000 feet of new channel. The project would also eliminate any need for maintenance of existing channelized outlet (to be abandoned). (Lower Snoqualmie River, Unincorporated)
0.7	0.9	L, R	<b>Deer Creek Flooding and Erosion:</b> Existing alignment of Deer Creek causes flood/storm risks to adjacent property and downstream sediment problems. (Lower Snoqualmie River, Unincorporated)	N	<b>Deer Creek Channel Relocation:</b> The project would relocate Deer Creek away from a farm road and two farm buildings, provide a more natural stream alignment and increase the stream reaches capacity to store sediment. (Lower Snoqualmie River, Unincorporated)
6.0	9.7	L	<b>Dutch Row Riverbank Erosion and Slumping:</b> The shoulder of the West Snoqualmie River road, which is a primary access to 25 large agricultural properties, is exhibiting slumping caused by scour on the left bank of the Snoqualmie River. (Lower Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
9.6	10.0	L	<b>Herman and Joy Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a levee or revetment maintenance need. (Lower Snoqualmie River, Unincorporated)	N	<b>HerbCo Farm:</b> The project will remove blackberry and knotweed and replant with native vegetation along 1000 feet of the Snoqualmie River and provide vegetation maintenance of the Herman and Joy revetments. (Lower Snoqualmie River, Unincorporated)
9.9	9.9	L	<b>Woodinville-Duvall Road Backwater Flooding and Bridge Abutment Erosion:</b> Fill placed in the floodplain for construction of the Woodinville-Duvall Road exacerbates flooding problems upstream of this heavily used cross-valley road. Despite the multiple bridges in this road fill, the road blocks most of the floodplain conveyance capacity, contributes to flood depths upstream, and can cause localized high-velocity flows that lead to scour damages on adjacent private lands. (Lower Snoqualmie River, Unincorporated, City of Duvall)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
13.5	13.65	R	<b>River Mile 13.5 River Bank Erosion:</b> Erosion along the right bank of the Snoqualmie river channel threatens to undermine the Tolt River water supply pipeline at this location south of Duvall. A rock revetment was installed in response to this problem in the 1960s, but little sign of that revetment remains. The bank erosion process in this area involves slumping of discrete failure blocks that can extend horizontally more than 50 feet from the top of bank. Replacement of this missing thin rock riprap revetment would do little to inhibit future bank failures of this type. (Lower Snoqualmie River, Unincorporated)	Y	<b>Tolt Pipeline Protection:</b> Install one or more engineered log jams to roughen the river channel near the toe of the eroding bank, thereby helping to reduce local water velocities and the resulting toe erosion process. (Lower Snoqualmie River, Unincorporated)
17.5	17.7	L	<b>Adair Road Revetment Failure:</b> Subgrade failure beneath the rock armor of the Adair Road revetment threatens this flood protection facility and road. In addition, the bank opposite this flood protection facility is actively eroding. (Lower Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
21.6	22.8	R	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Stillwater Habitat Restoration:</b> The project would restore natural processes to this segment of the river by removing levee and revetments across from Chinook Bend. Riparian plantings would occur at the same time. The project would reduce need for maintenance of existing Meehan/Game Farm levee (portion to be removed). (Lower Snoqualmie River, Unincorporated)
21.6	22.8	L	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Chinook Bend Reach Restoration:</b> The project is to consider removing the levees on the Chinook Bend Natural Area. Removal of the levee would allow better access to the floodplain and encourage channel migration across the bend. In addition, removal of the levee would eliminate any need for maintenance of existing Carnation Farms Upper levee (to be removed). (Lower Snoqualmie River, Unincorporated)
22.8	23.6	R	<b>NE 50th to Horseshoe Lake Flooding and Erosion:</b> Flood flows over the right bank of the Snoqualmie River cause minor damage to 55th Ave NE and more significant damage to the more heavily used Carnation Farms Road. (Lower Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
23.0	23.6	R	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>McElhoe/Pearson Levee:</b> The project will remove or setting back about 1,300 feet of the levee, reconnecting floodplain habitat and increasing side channel formation. The setback project would reduce the need for maintenance and flood repair along existing McElhoe/Person levee. (Lower Snoqualmie River, Unincorporated)
23.4	23.5	L	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Camp Gilead Off-Channel Reconnection:</b> The project will remove approximately 400 feet of King County levee on the Snoqualmie River and eliminate any need for maintenance to this part of existing Camp Gilead levee (to be removed). Fish access to four acres of off-channel habitat and approximately 1.3 miles of stream would be restored. (Lower Snoqualmie River, Unincorporated)
24.0	24.4	L	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Snoqualmie River Footbridge Off Channel Reconnection:</b> Reconnection of floodplain for flood storage to reduce risk of damage to existing revetments on opposite river bank and to the properties those revetments protect without impacting the park facilities. (Lower Snoqualmie River, Unincorporated)
26.9	27.5	L	<b>Byers Farm Flood Damage:</b> Unique hydraulic patterns on the Byers farm cause massive and repetitive deposition of flood-borne debris - mostly fallen trees - on arable land. (Lower Snoqualmie River, Unincorporated)	N	<b>Snoqualmie River Byers Floodplain and Riparian Restoration:</b> Install a 600 foot long "drift fence" to capture the large amount of woody debris that is accumulating in the back/tree line of the property to reduce erosion along agricultural property. (Lower Snoqualmie River, Unincorporated)
27.1	27.3	R	<b>Pleasant Hill and Lynn Revetment Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a flood protection facility maintenance need. (Lower Snoqualmie River, Unincorporated)	N	<b>Stout Property Restoration:</b> This project would plant approximately two acres of riparian habitat along the Pleasant Hill School and Lynn revetments on the mainstem Snoqualmie River to reduce erosion and long-term maintenance costs. (Lower Snoqualmie River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
28.5	28.8	L	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Lower Snoqualmie River, Unincorporated)	N	<b>Gonneson Revetment Removal/Acquisition:</b> The project will restore the Snoqualmie River to allow it to migrate laterally along this meander bend by removing existing bank armor. This proposal would require the acquisition of 12 acres of property in order to allow the project to occur. It would also eliminate any need for maintenance of existing Gonneson revetment (to be removed). (Lower Snoqualmie River, Unincorporated)
28.7	29.5	L	<b>Vegetation Maintenance:</b> Existing levees and revetments have been built to reduce risk of damage from flooding and erosion. This represents a significant extent of riparian land that has problems with invasive, non-native vegetation. Eradication of these invasive plants and the establishment of native riparian plantings remain as a levee or revetment maintenance need. (Lower Snoqualmie River, Unincorporated)	N	<b>Jubilee Farm:</b> This project will remove invasive species and plant a 50 to 70 foot buffer along one mile of the Snoqualmie River. The proposal would provide vegetation maintenance of Harry Peterson, Angerer Upper, and Angerer Lower revetments (to be planted) (Lower Snoqualmie River, Unincorporated)
30.5	32.8	R	<b>SE 19<sup>th</sup> Way Road and Revetment Damage:</b> Erosion along the left bank of the Snoqualmie River channel threatens to undermine the road bed of SE 19 <sup>th</sup> Way, which serves one farm. A rock revetment was installed in response to this problem in the 1960s, but the problems involve deep failure surfaces that have not been stabilized by the rock riprap. (Lower Snoqualmie River, Unincorporated)	Y	<b>SE 19<sup>th</sup> Way Buyout:</b> The proposal would be to work with the property owner to purchase the farm served by this road. Then abandon the road and allow natural river processes to occur. (Lower Snoqualmie River, Unincorporated)
33.5	34.3	L	<b>Aldair Neighborhood Flooding:</b> During recent flood events, the Aldair levee has had problems with extensive and increasing seepage. Ponds behind the levee have shown an unusual silty coloration when these recent seepage problems have been observed. This suggests possible piping (underground erosion) of fine material from the levee and the underlying banks. Piping can lead to sudden, catastrophic levee breach. (Lower Snoqualmie River, Unincorporated)	Y	<b>Aldair Buyout:</b> Remove existing homes from low-lying ground immediately behind the Aldair levee. (Lower Snoqualmie River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
34.2	34.2	R	<b>Escape Dike Emergency Evacuation Road Damage and Backwater Flooding:</b> Overbank flows frequently damage an emergency evacuation road constructed for residents in the vicinity of Neal Road. The tendency for this flood protection facility to be damaged during floods makes it unreliable as an emergency evaluation route. In addition, the presence of this flood protection facility across the overbank flow area contributes to backwater flooding upstream of the flood protection facility. (Lower Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.
32.5	33.5	R	<b>Neal Road Relocation:</b> Erosion along the right bank of the Snoqualmie River channel has undermined a portion of the Neal Road, which runs parallel to the Fall City-Carnation Road (SR 203) and serves several farms and a public boat ramp. A rock revetment was installed in response to this problem in the 1960s, but the problems involve deep failure surfaces that have not been stabilized by the rock riprap. The north end of the Neal Road has been closed since it was undermined in 2003. (Lower Snoqualmie River, Unincorporated)	Y	<b>Neal Road Relocation:</b> The project would eliminate the public safety hazard associated with potential road failure and improve emergency access to flood-prone farms. The project would also minimize disturbance of river channel environment, as well as need for future inspection, maintenance and repair. (Lower Snoqualmie River, Unincorporated)
33.6	35.0	L, R	See <b>Aldair Neighborhood Flooding</b> discussion (above).	N	<b>Snoqualmie River Fall City Reach Reconnection and Acquisition:</b> The project would reconnect adjacent floodplain for flood conveyance and storage without impacting Neal Road or nearby residents. (Lower Snoqualmie River, Unincorporated)
35.4	36.3	R	<b>Washington State Department of Transportation Spillway Flooding:</b> Floodwaters overtop SR 202 where it abuts the right bank of the Snoqualmie River, across from and upstream of the Raging River confluence. This causes deep, fast, erosive flows in the rural residential area. (Lower Snoqualmie River, Unincorporated)	N	Feasibility and technical analysis required.

**Tolt River (WRIA 7)**

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.5	0.5	L	<b>Parcel Number 2125079024:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Tolt River, Unincorporated)	Y	<b>Tolt River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Tolt River, Unincorporated)
0.5	0.5	L	<b>Parcel Number 2125079038:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Tolt River, Unincorporated)	Y	<b>Tolt River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Tolt River, Unincorporated)
0.0	2.0	L, R	<b>Tolt River Levee Confinement:</b> The existing levee system confines the Tolt River to a relatively narrow corridor, limiting its capacity for flood conveyance. The levees also limit the area available for sediment deposition, so the vertical rate of aggradation is exaggerated. This, in turn, reduces the levee system's conveyance capacity over time, meaning that flood risks in the surrounding area are increasing. Further, the levees restrict use of natural habitats such as the 35-acre wetland channel complex in the south end of the Tolt-MacDonald Park, a smaller wetland complex south of Tolt High School, and similar features between the river and the Tolt Hill Road. (Tolt River, Unincorporated, City of Carnation)	Y	<b>Tolt River Mouth to State Route 203 Floodplain Reconnection and Technical Support; Tolt River State Route 203 to Trail Bridge Floodplain Reconnection:</b> Set back existing levee. (Tolt River, Unincorporated, City of Carnation)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.8	1.2	L	<b>Tolt River Containment in Swiftwater Area:</b> Channel confinement by the right and left bank levee, and frequent accumulation of large woody debris on the Snoqualmie Trail Bridge, currently creates a risk of serious flooding through the town of Carnation via overtopping of the right bank levee and a secondary containment berm. In addition, several homes and as-yet-undeveloped parcels along NE 32nd St on the left bank are subject to frequent flooding. (Tolt River, Unincorporated, City of Carnation)	Y	<b>Tolt River Mile 1.1 Levee Setback:</b> The existing left bank levee was constructed well riverward of the southernmost abutment of the Snoqualmie Trail Bridge, unnecessarily confining the channel beneath this span. The proposed project would increase conveyance beneath the Trail Bridge by removing 2000 feet of the existing levee and reconstructing a new levee adjacent to the southern bridge abutment. This construction would require the acquisition of 16 flood prone parcels on the left bank and approximately 1.5 acres of Remlinger Farm. The new levee would be constructed at more stable slope than the existing flood protection facility and would include the installation of large woody debris and establishment of native vegetation in the project area. (Tolt River, Unincorporated, City of Carnation)
1.1	1.7	R	See <b>Tolt River Levee Confinement</b> and <b>Tolt River Containment in Swiftwater Area</b> descriptions (above).	N	<b>Lower Tolt River Acquisition:</b> The purpose of this project is to permanently protect a natural floodplain buffer between the City of Carnation and the Tolt River through acquisition of 6.7 acres of habitat in the floodway. To accomplish this, the project would acquire flood-prone land. (Tolt River, Unincorporated, City of Carnation)
2.3	2.9	R	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce the risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Tolt River, Unincorporated)	N	<b>Tolt River Natural Area Floodplain Reconnection/Acquisition:</b> This project would assess the feasibility of removing a levee that is currently disconnecting a side channel from being active. In order to remove the levee two homeowners must be bought out as they are directly in the old side channel. The project would reduce the need for maintenance of existing Edenholm levee (portion to be removed) resulting in an elimination of the risk to two homes. (Tolt River, Unincorporated)
2.8	2.9	R	<b>Tolt River Road Shoulder Protection:</b> Erosion along the right bank of the Tolt River channel threatens to undermine the Tolt River Road at this location, roughly 1.5 miles east of SR 203. A rock revetment was installed as an emergency response to this problem during the 1990 flood, and is still working to stabilize a portion of the road. However, the road is not defended against recent erosion upstream of that rock revetment. (Tolt River, Unincorporated)	Y	<b>Tolt River Road Shoulder Protection:</b> Install a 200-foot windrow of buried rock riprap along the shoulder of the Tolt River Road to protect it from erosion upstream of the existing revetment. (Tolt River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
4.2	4.9	R	<b>San Souci Neighborhood Flooding:</b> Deep, fast flood waters surround several residences in the San Souci area. These can isolate the neighborhood, preventing travel in or out, during relatively minor flood events. Many residents elect to stay in these homes, which are higher than moderate flood levels. However, all of the homes are at risk during extreme flood events. By the time the hazard becomes convincingly visible, high water may prevent evacuation. This compounds the life safety concerns in this area. (Tolt River, Unincorporated)	Y	<b>San Souci Neighborhood Buyout:</b> Remove all homes from this hazardous area. Then, remove existing rubble levee at upstream end of community access road. (Tolt River, Unincorporated)
2.0	6.0	L, R	<b>Tolt River Residential Hazards:</b> Problems described above for the San Souci area exist more generally. Due to the severity and concentration of these problems at San Souci, it is a priority for action, but similar needs will remain after that project is complete. (Tolt River, Unincorporated)	N	Feasibility and technical analysis required.



**Raging River (WRIA 7)**

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.0	1.5	L, R	<b>Fall City Area Channel Aggradation and Flooding:</b> Although the Fall City levees were raised in 1997, channel aggradation continues in a manner that is expected to diminish flood containment capacity, particularly downstream of the Preston-Fall city Road Bridge at RM 0.5. Channel aggradation upstream of the Preston-Fall City Road bridge is not as severe as in the downstream reach, but continued aggradation, combined with the already constrained channel and the angle at which the river passes under the bridge, will create an increasing risk for flooding through Fall City. (Raging River, Unincorporated)	Y	<b>Fall City Levee Setback Feasibility Study:</b> The proposed project would involve setting back portions of the existing levee system on both the right and left banks to increase channel capacity and optimize the angle at which the Raging River passes under the Preston-Fall City Road Bridge. The project would require acquisition of, or additional easement rights across, up to seven privately held parcels on the left bank of the river and up to 31 parcels on the right bank of the river. Because of the large number of property owners and stakeholders that would be involved in project, and the potential for alternative solutions, work on this project is currently proposed to be limited to the completion of a feasibility study. (Raging River, Unincorporated)
0.0	0.4	R	See <b>Fall City Area Channel Aggradation and Flooding</b> description (above).	N	<b>Lower Raging River Restoration:</b> This project seeks to setback existing Raging River levee system to increase its level of flood protection to the Fall City community. (Raging River, Unincorporated)
1.45	2.30	L,R	<b>Preston-Fall City Road Flooding and Erosion A:</b> Rural residential development and construction of 0.4 miles of the Preston Fall City Road within the flood hazard corridor has left both the road, several private residences and one bridge at risk from flooding and erosion. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
2.40	2.95	L, R	<b>Preston Fall City Erosion and Flooding B:</b> Approximately 700 linear feet of the Preston-Fall City Road and two homes are in, or immediately adjacent to, the moderate channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
3.05	3.25	L	<b>Preston - Fall City Road Erosion and Flooding C:</b> Approximately 300 linear feet of the Preston-Fall City Road and one home are in, or immediately adjacent to, the moderate channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
3.30	3.40	L	<b>Preston - Fall City Road Erosion and Flooding D:</b> Approximately 500 linear feet of the Preston-Fall City Road is in, or immediately adjacent to, the moderate channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
3.40	3.60	L	<b>Preston - Fall City Road Erosion and Flooding E:</b> Approximately 400 linear feet of the Preston-Fall City Road and two homes adjacent to this stretch of road are, or immediately adjacent to, the channel migration zone. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.00	4.04	R	<b>Ferchaud Property Erosion:</b> A single home built in the moderate channel migration hazard area is at risk from erosion. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.0	4.4	L	<b>Levee and Revetment Maintenance:</b> Existing levees and revetments have been built to reduce the risk of damage from flooding and erosion. These facilities require maintenance and repair in order to preserve their function. (Raging River, Unincorporated)	N	<b>Raging River Preston Reach Restoration/Acquisition:</b> This project would restore access to 7 acres of floodplain by acquiring 10 acres immediately upstream and eliminating any need for maintenance of existing Carlin levee (to be removed). (Raging River, Unincorporated)
3.80	4.20	L	<b>Preston - Fall City Road Erosion and Flooding:</b> Approximately 1600 linear feet of the Preston-Fall City Road is immediately adjacent to the moderate or severe channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.30	4.47	L, R	<b>Town of Preston Residential Erosion:</b> Homes and a church camp downstream from the SE 86th St Bridge are at risk from erosion. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.70	4.90	L, R	<b>Upper Preston Road Erosion A:</b> 0.3 miles of the Upper Preston Road and road bridge are within the moderate or severe channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.82	4.94	L, R	<b>Hursh Neighborhood Access Erosion:</b> Erosion around the freeway support on the left bank of the river may threaten the sole access to the upstream community of five or six homes. Most of access road is in severe channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
4.95	5.08	R	<b>Hursh Revetment Channel Constriction:</b> The Hursh revetment limits river migration toward the left bank and may contribute to erosion on the right bank, at the base of the Upper Preston Fall City Road. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
4.95	5.12	R	<b>Upper Preston Road above I-90 A Erosion Potential:</b> A 0.18 mile section of the Upper Preston Road sits at the top of a steep slope adjacent to the severe channel migration hazard area and within the buffer. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
5.10	5.14	L, R	<b>Abandoned Bridge Abutment and Waring Revetment Channel Constriction:</b> The remains of a set of abandoned private bridge abutments could catch debris resulting in gravel deposition upstream of the constriction and an avulsion into a high-flow channel on the right bank. Such an avulsion would direct erosive flood flows into the upstream side of the Waring property. Currently the river seems to be trying to move left behind concrete bridge abutment which has already contributed to the formation of a small logjam which is probably helping stabilize the left bank. A left bank utility pole serving the left bank community is at risk. If the bridge abutments are removed and the Waring revetment remains, erosion on the left bank would probably increase. (Raging River, Unincorporated)	Y	See <b>Alpine Manor Mobile Home Park Neighborhood Buyout</b> below

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.1	5.4	L	<b>Alpine Manor Mobile Home Park Channel Avulsion Risk:</b> Flow between the cabled-log Jelstrup revetment and the Hess rock revetment could result in a channel avulsion through the Alpine Mobile Home Park. Nine of the approximately 35 homes in the mobile home park are in the severe or moderate channel migration hazard area. Five homes in the neighborhood are also within the channel migration zone. While none of these homes are within the regulatory floodplain, flooding was observed throughout this neighborhood during the November 1990 flood, which reached a peak of 6,220 cubic feet per second at the U.S. Geological Survey river flow gage. This flow is somewhat lower than the calculated 100-year flood peak of 6,970 cubic feet per second for the Raging River. (Raging River, Unincorporated)	Y	<b>Alpine Manor Mobile Home Park Neighborhood Buyout:</b> The proposed project would include the acquisition and removal of most, if not all of the homes in the neighborhood, and restoration of this riparian area in a manner that supports salmon recovery needs. The project could be phased through a long-term acquisition and restoration strategy. (Raging River, Unincorporated)
5.38	5.55	R	<b>Upper Preston Road Slope Instability:</b> A shift in flow patterns could result in increased flows in a side channel running along the slope upon which the Upper Preston Road has been built resulting in erosion and potential slope failure. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
5.55	5.75	R	<b>Dumond-Georgeff Property Erosion:</b> Continued erosion and flooding at the Dumond property has prompted the downstream neighbor to add rock along the top of the bank to try and reduce flooding on his property. This fill is prohibited in the FEMA covenants that allowed King County to purchase the property as a flood buyout. At least three other homes in this area are within either the severe or moderate channel migration hazard area. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
6.50	6.71	R	<b>Raging River Mile 6.6 R Neighborhood Erosion and Buffer Degradation:</b> Development in the channel migration zone and buffer has left one home at risk from erosion from the moderate channel migration hazard area and resulted in the degradation of approximately 1100 linear feet of riverbank. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.13	7.53	R	<b>Raging River Mile 7.3 Channel Migration Zone:</b> Development in the channel migration zone and buffer has left six homes at risk from the severe channel migration hazard area and somewhat degraded the aquatic area buffer. One home is at risk from erosion from the moderate channel migration hazard area and has resulted in the degradation of approximately 1100 linear feet of riverbank. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.
7.64	8.14	L,R	<b>Arruda Neighborhood Residential Flooding and Erosion:</b> Several homes off the end of the Upper Preston Road are at varying degrees of risk from channel migration. (Raging River, Unincorporated)	N	Feasibility and technical analysis required.

**Sammamish River and Issaquah Creek (WRIA 8)**

<b>DS RM</b>	<b>US RM</b>	<b>Bank</b>	<b>Flood or Channel Migration Risk</b>	<b>In Action Plan?</b>	<b>Proposed Project</b>
0.0	14.0	L, R	<b>Sammamish River Flood Study:</b> Survey data for the Sammamish River dates from 1965. Extensive urban development in the basin has altered flows and sediment loads entering from tributaries. The contour interval used for these existing flood maps is five feet rather than the more detailed interval of two feet. A two-foot interval greatly improves the mapping accuracy of flood hazard boundaries, used in planning future development in the valley. The insurance analysis performed in the Risk Assessment for this Plan in Appendix C supports the need for mapping by identifying that 71 percent of the flood insurance policies in force within the Sammamish River basin are outside the mapped 100-year floodplain. (Sammamish River, Unincorporated, Cities of Redmond, Woodinville, Bothell, and Kenmore)	Y	<b>Sammamish River Flood Study:</b> Prepare flood study and corresponding FEMA Flood Insurance Studies and Flood Insurance Rate Maps for the Sammamish River. (Sammamish River, Unincorporated, Cities of Redmond, Woodinville, Bothell, and Kenmore)
8.2	8.2	R	<b>Parcel Number 2616800580:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Issaquah Creek, Unincorporated)	Y	<b>Sammamish River (Issaquah Creek) Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Issaquah Creek, Unincorporated)
10.2	10.2	R	<b>Parcel Number 2616800580:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Issaquah Creek, Unincorporated)	Y	<b>Sammamish River (Issaquah Creek) Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Issaquah Creek, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.00	14.00	L, R	<p><b>Sammamish Flood Protection Facility Maintenance and Management:</b> The entire Sammamish River was dredged and channelized in the 1960s in order to reduce spring flooding of the agricultural lands that comprised the floodplain. This channelization followed the 1914 lowering of the water surface at its mouth in Lake Washington, which occurred as a result of construction of the Hiram Chittenden Locks. These two large-scale projects, designed and constructed by the U.S. Army Corps of Engineers, successfully reduced the extent and frequency of floodplain inundation so that flooding is largely confined within the existing channel for all but the greatest floods. However, the deepened and straightened river became isolated from its floodplain, tributary streams were disconnected at their mouths, and the complex bends and turns of the river were removed. Additionally, protocols established by the U.S. Army Corps of Engineers for channel maintenance requires that the County perform extensive clearing of vegetation, native and non-native, from the river's banks and remove accumulations of debris from within the channel along its entire 14 mile length. This maintenance regimen is often in conflict with healthy ecosystem management and the goals for recovery of federal Endangered Species Act listed species, and may not be permissible given current day regulations. (Sammamish River, Unincorporated, Cities of Redmond, Woodinville, Bothell, and Kenmore)</p>	N	<p><b>Sammamish Bank Restoration:</b> Set back banks to accommodate riparian vegetation while maintaining flood protection. Re-vegetate denuded areas with native species, install additional instream features and create cool water refuge areas to support habitat within the river corridor. (Sammamish River, Unincorporated, Cities of Redmond, Woodinville, Bothell, and Kenmore)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.0	0.0	N/A	<b>Delta Sedimentation at Mouth:</b> Sediment frequently tends to build up just downstream from the mouth of the river, forming a delta in Lake Washington. Periodically, dredging of these accumulated sediments is performed by the U.S. Army Corps of Engineers in order to maintain commercial navigation at the north end of the lake. During the interval between dredging, the expanding delta in the lake may reduce river velocities at the river's outlet, leading to sediment build-up in the channel. Homeowners along the lower end of the river frequently request that King County dredge the river in order to maintain recreational navigation for large-hulled boats between the river and the lake. (Sammamish River, City of Kenmore)	N	Feasibility and technical analysis required.
13.0	13.25	L, R	<b>Willowmoor Farms - Marymoor:</b> The headwaters of the Sammamish River are located within Marymoor Park, where the river is formed by the outflow from Lake Sammamish. The engineered flood protection of this river system is initiated within its first 1,400 feet, in an area called the Transition Zone, where lake outflows spill over a low weir into a wide river cross-section. This area encompasses the steepest gradient portion of the entire river. At the downstream end of the transition zone, the river tapers to the standard cross-section that defines the remaining 13.5 miles of the river. The configuration of this transition zone is considered central in establishing the flood conveyance capability for this river system. Maintenance of the flood protection mechanism of this transition zone, as currently constructed, requires regular removal of vegetation within the riparian buffer, which is not only highly damaging to water quality and habitat, but is also protecting ecological elements to recover federal Endangered Species Act-listed species. (Sammamish River, City of Redmond)	Y	<b>Willowmoor Floodplain Restoration:</b> Reconfigure the transition zone in order to increase channel complexity, establish a native plant community and riparian buffer, and maintain adequate flow conveyance to meet flood protection obligations in a sustainable manner. Preliminary studies point to widening the total cross-sectional area available for flood flows so that native vegetation can be retained throughout the riparian zone without obstructing conveyance; and possible construction of a new high flow bypass channel to provide additional conveyance out of the Lake during flood events. Instream complexity will be improved by both structural changes that are engineered in the design, as well as natural geomorphic changes that occur over time in response to the structural modifications. (Sammamish River, City of Redmond)
11.5	11.5	L, R	<b>252nd Street:</b> Erosion threatens the streambank in three locations, placing 500 linear feet of 252nd Street and other properties at risk. (Issaquah Creek, Unincorporated)	N	<b>Issaquah Streambank Restoration:</b> Complete biotechnical bank stabilization projects at 3 sites along Issaquah Creek. (Issaquah Creek, Unincorporated)



**Cedar River (WRIA 8)**

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.5	5.5	R	<b>Parcel Number 2323059098:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
11.6	11.6	L	<b>Parcel Number 3223069089:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
11.7	11.7	L	<b>Parcel Number 3223069017:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
15.2	15.2	R	<b>Parcel Number 5108400040:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.2	15.2	R	<b>Parcel Number 5108400041:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
17.1	17.1	R	<b>Parcel Number 6399600105:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
17.2	17.2	R	<b>Parcel Number 6399600140:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
17.2	17.2	R	<b>Parcel Number 6399600145:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
19.6	19.6	R	<b>Parcel Number 2322069086:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Cedar River, Unincorporated)	Y	<b>Cedar River Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Cedar River, Unincorporated)
0.0	1.25	N/A	<b>Cedar River Gravel Aggregation at Mouth:</b> On average, 10,000 to 12,000 cubic yards of gravel passes as bedload through the lower mainstem Cedar River each year. Of that, about half is deposited in the lowest 1.25 miles of the river at an average annual rate of gravel accumulation of about 6,000 cubic yards per year, while the balance comes to rest on the delta in Lake Washington. This ongoing deposition occurs in a segment of the Cedar River that lies adjacent to Renton Municipal Airport, Boeing property, areas of downtown Renton, and other public and private properties. Periodic dredging of gravel and sediment has been employed to maintain flow conveyance through this reach in order to avert flood damages to the regionally significant economic investments clustered in the vicinity. (Cedar River, City of Renton)	Y	<b>Cedar River Gravel Removal Project:</b> The proposed action includes three elements: periodic gravel removal, spawning channel replacement and upper watershed gravel supplementation. The periodic gravel removal maintenance will be performed to maintain the project flood protection benefits as required in the Project Cooperation Agreement between the City of Renton and the U.S. Army Corp of Engineers. During gravel removal maintenance actions, the Cedar River channel within the project area will be excavated to a depth of 4-feet below the 1995 bed profile. The average annual maintenance dredging as estimated by the U.S. Army Corps of Engineers is expected to be \$2.4 million every three years. To replace the lost ground water spawning channel, the spawning channel replacement project is proposed at River Mile 3.5. The spawning channel replacement will consist of constructing a 950-foot long by 10-foot wide channel that contains large woody debris, native plants and spawning gravel, and is connected to the Cedar River with an inlet structure. (Cedar River, Unincorporated, City of Renton)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
3.30	4.30	R	<b>Maplewood Residential:</b> A densely populated residential neighborhood on the right bank is subject to a number of flood-related hazards. Two to three homes at the upstream end experience overbank flooding during moderate flood events when the Erickson Revetment is overtopped. The Brodell Revetment, located at the downstream end of the neighborhood, primarily functions to reduce erosion that might allow the channel to migrate toward SR-169. According to a new mapping study by the City of Renton, more than half the neighborhood would be inundated by shallow flooding in a 100-year event. In addition, an active landslide scarp is located on the opposite bank. The Person Revetment was built to stabilize the slope, but is typically overwhelmed by the large scale of the landslide feature. The occurrence of a major landslide could block all or a portion of the channel suddenly and unexpectedly, which could force deep and fast river flows across the residential area with potentially devastating results. (Cedar River, Unincorporated)	N	<b>Maplewood:</b> Solution alternatives to reduce the flood risk appear limited due to the potential for catastrophic event to be triggered by a landslide. Explore options for setting back the banks to increase conveyance, independently or in combination with possible flood buyouts from willing sellers in this neighborhood. Bank work should incorporate the use of bioengineering and other techniques to reduce rock armoring. Where possible explore opportunities to restore connection between the river and the floodplain for both flood and habitat benefits. (Cedar River, Unincorporated)
5.30	5.50	L, R	<b>Elliott Bridge:</b> Homes on the left bank above and below the Elliott Bridge are subject to high velocity flows, channel migration, or both. One of the homes is identified as a repetitive loss property. A major landslide hazard is located immediately downstream from the homes. Blockage of the river due to landslide activity causes flows to back up in and around the nearby homes, further increasing flood risks in this area. The existing bridge abutments and approach road are a constriction to flow, but a scheduled removal of the bridge abutments may help alleviate the constriction. (Cedar River, Unincorporated)	N	<b>Elliott Bridge:</b> Remove former Elliott Bridge and pursue acquisition of flood-prone and repetitive loss homes. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.25	5.8		<b>Lower Jones Road Residential:</b> Jones Road parallels a segment of the Cedar River with no more than a narrow strip of land, occupied by numerous homes, in between. These homes are in the floodplain and appear to be in the severe channel migration hazard area based on preliminary findings of channel migration zone mapping in progress. Most of these homes are built right at the top-of-bank, leaving insufficient room to setback the banks to improve either the level of protection or the structural integrity of the bank. Despite extensive private investment to armor the banks, the risk of erosion and undercutting pose a serious threat to the homes. At least one home in this reach is a repetitive loss. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.
5.8	6.2	R	<b>Lower Jones Road at Buck's Curve:</b> The entire length of Jones Road follows the Cedar River, and nearly a mile of it lies within the river's floodplain, and what appears to be the severe channel migration hazard area, based on preliminary results of the channel migration zone study underway, or both. At Buck's Curve, where the river immediately abuts the road shoulder, King County maintains a flood protection facility to protect the road. This flood protection facility is prone to scour and erosion and is vulnerable to significant structural damage during high flows. In addition, the confinement perpetuated by the armored right bank deflects flood flows directly toward the Cedar River Trail Revetment that protects not only the regional trail, but also the Maple Valley Highway (SR-169) on the opposite bank. The revetment protecting the road regularly experiences flood damage and requires costly maintenance, but has no room within the existing right-of-way to be setback or retrofitted to a more stable slope. (Cedar River, Unincorporated)	Y	<b>Lower Jones Road Setback Project:</b> The riverbanks should be setback along this entire length of river to provide more room for flood conveyance and to reduce the risks of ongoing flood damage. At its upstream end, the flood protection facility and about a 1500-foot section of Jones Road will need to be relocated landward to accommodate a stable slope angle on the banks, improved conveyance in the channel, and a buffer separating the river and the road. This will require purchase of an easement through several contiguous properties on the landward side of the road, and may require some additional property easements or acquisitions. As part of a longer term solution, the remaining high risk flood-prone homes downstream should be acquired; banks should be setback; and the riparian buffer should be restored with native vegetation. Elements of this project have already been initiated. In recent years, King County has purchased numerous homes along this reach for both flood hazard management and road construction purposes, reducing the number of vulnerable structures. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.4	6.7	R	<p><b>Herzman and Cedar River Trail Levees:</b> The Herzman Levee extends 17-18 feet high in an over-steepened configuration lining 840 feet of river bank. It reduces the risk of channel migration, but is not continuous with high ground and does not provide flood containment. Seepage is common behind the levee in an area of low undeveloped floodplain formerly occupied by the river. Several residential properties, as well as a section of Jones Road, are located further behind the levee. These structures are set back several hundred feet from the river on a section of high ground above the flood elevation, and they do not experience flooding as a result of the seepage, overtopping or backwater behind the levee. The flood protection facility, therefore, unnecessarily constricts flows within the channel, forcing the full momentum of the river directly into Cedar River Trail levee on the immediate opposite bank. This significantly increases the risk of flood damage to that levee which protects both the trail and the Maple Valley Highway (SR-169). In addition, the Herzman levee prevents the river's ability to occupy of the undeveloped land immediately behind the levee, and in doing so obstructs the natural floodplain processes, reducing the quality and quantity of riparian habitat, and preventing development of a healthy vegetative buffer in an area of high fish use. (Cedar River, Unincorporated)</p>	Y	<p><b>Herzman Levee Setback and Floodplain Reconnection:</b> Remove approximately 350 linear feet and setback another 190 linear feet of the levee in a manner that will reconnect the river with its floodplain without increasing flood risks to the existing homes or Jones Road. (Cedar River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.50	7.3	L, R	<p><b>Brassfield / Riverbend / Cavanaugh Revetments:</b> Revetments constrain both sides of the river in much of this segment, creating high velocities and elevated flood levels. As a result, the flood protection facilities are highly susceptible to erosion and scour. On the right bank, the Brassfield Revetment armors the bank against undercutting to protect a row of homes located just along the top-of-bank, and Jones Road behind them. On the left bank the Riverbend Revetment has two primary functions. At its upstream end, it abuts the Riverbend Mobile Home Park reducing erosion and undercutting, especially along the front row of about 15 mobile homes. The downstream extension of the Riverbend revetment protects the ecologically-significant Cavanaugh Pond from regular overtopping and channel migration, but this armoring may interfere with beneficial ecosystem processes. The banks throughout this area are over steepened, and the flood protection facilities are a major encroachment into the river channel, leading to increased velocities, reduced instream habitat, and inadequate riparian buffer. Both flood protection facilities experienced significant damages in recent floods, and while repaired, remain vulnerable. (Cedar River, Unincorporated)</p>	N	<p><b>Riverbend Trailer Park:</b> One possible flood hazard management strategy could involve purchasing and removing the 19 mobile homes nearest river and the property underlying them, combined with a recontour of the existing revetment to set it back and reduce its slope, thereby reducing flood damage to the flood protection facility and the homes. These efforts would also improve flood conveyance through the reach, reducing impact on neighboring properties and facilities as well as improving habitat. Alternatively, the entire park could be purchased, removing all structures and opening up the entire floodplain for conveyance. (Cedar River, Unincorporated)</p> <p><b>Brassfield:</b> Similar to Riverbend on the opposite bank, one possible flood solution could involve exploring possible flood buyouts and levee setback or removal opportunities to reduce damages to the flood protection facility and adjacent homes, as well as neighboring homes and structures. (Cedar River, Unincorporated)</p> <p><b>Cavanaugh:</b> Explore the possibility of lowering flood elevations and velocities and increasing overbank conveyance by removal or setback of the levee/revetment that currently separates Cavanaugh Pond from the mainstem river. (Cedar River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.3	7.75	L, R	<b>Cedar Rapids (Ricardi) Levee:</b> Levees on both banks in this area constrict the floodway, increasing velocities and flood depths within the channel, resulting in a higher risk of scour and erosion to flood protection facilities within and downstream from the site, including the flood protection facilities at Ricardi, Riverbend, and Brassfield-Maxwell as well as Jones Road. In the early 1990s, two severely flood-prone homes on the right bank were purchased, the structures were removed, and the lands were designated as permanent open space. The Ricardi Levee that formerly protected the homes, however, was left in place and remains an impediment to flood conveyance and floodplain processes. Similarly, on the left bank, the Riverbend Levee cuts off conveyance through about 5 acres of undeveloped floodplain land along the upstream portion of a 100-unit mobile home park. The position of these levees, right at the edge of the low flow channel, unnecessarily isolates the river from its adjacent floodplain, increasing the risk of flood damage to these and neighboring flood protection facilities and limiting natural habitat-forming processes. (Cedar River, Unincorporated)	Y	<b>Cedar Rapids Levee Setback:</b> Additional acquisitions of adjacent and contiguous lands on both the left bank and the right bank would create an opportunity to set back the existing levees and restore beneficial floodplain functions and processes. The project will involve removing or setting back approximately 800 linear feet of fill and riprap comprising the right bank levee, and setting back a similar length of levee on the left bank, in order to open up the floodplain to more frequent overbank flows while continuing to maintain existing levels of flood protection to Jones Road and downstream properties, including the mobile home park. The long range plans for this area could include acquisition of additional properties remaining at risk from flood hazards and set back of greater length or extent. (Cedar River, Unincorporated)



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.75	8.50	R	<b>Horse Farm:</b> The Cook-Jefferies Revetment extends along the entire right bank through this reach and is a constriction to flood conveyance and channel forming processes. Portions of the revetment were modified by an adjacent landowner. Large rounded rocks were placed on the banks and toe. This rock overlay is intact along some portions of the flood protection facility, but in others it is placed over scour and erosion damage. This modified reach is likely to be unstable and vulnerable during future flood events, but does not pose a direct risk to homes, or public safety. At the downstream end, a former oxbow, lined by mature cottonwood trees, is still present but disconnected from the river by the revetment. Throughout the reach, the right bank revetment forces flood flows toward the two left bank flood protection facilities that protect the Cedar River Trail, the Maple Valley Highway, and portions of the regional park system. Lacking room for setback, these two flood protection facilities are over-steepened and highly susceptible to erosion and scour. The revetment also prevents connection to the former oxbow, limiting the availability and quality of habitat. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.
8.50	9.40	L, R	<b>Big Bend:</b> A number of homes on the right bank are located in an area of severe channel migration based on preliminary findings of the channel migration zone study currently underway. Toward the middle of this segment, several additional homes are behind the Scott Indian Grove Revetment. Most of these homes are on relatively high ground, and are not known to experience regular flooding. However, they are susceptible to undermining by channel migration or erosion. At the downstream end, there are no homes at risk, but the Scott-Indian Grove revetment constricts conveyance, deflects flows toward the Cedar River Trail flood protection facility, and prevents natural river processes and establishment of an adequate riparian buffer. (Cedar River, Unincorporated)	N	<b>Scott-Indian/Jones Reach:</b> The homes are not known to experience regular flooding, but are susceptible to undermining by channel migration or erosion. One possible alternative to address the over-steepened banks should explore options for setting back the banks to increase conveyance, independently or in combination with possible flood buyouts from willing sellers in this neighborhood. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
9.35	9.8	L	<b>Cedar Mountain:</b> This reach contains two left bank flood protection facilities and a bridge, and is underlain by one of the river's few areas of bedrock. Toward the upstream end, the Cummins levee provides limited reduction in overbank flooding at low to moderate flood events affecting one or two homes. The river is confined by bedrock on the opposite bank, making the flood protection facility a constriction to flood conveyance and channel process. Downstream, a gravel bar has formed riverward of the Littlefield revetment, making it obsolete. New abutments were installed along both banks for support of the reconstructed Jones Road Bridge. These are expected to provide substantial stability in this segment of the river, but a portion of the Cedar River Trail protection downstream from the abutment on the left bank may remain vulnerable to scour, erosion, or slumping. (Cedar River, Unincorporated)	N	<b>Littlefield-Cummins/Belmondo:</b> One alternative solution through this area could involve exploring options for setting back the banks to increase conveyance, independently or in combination with possible flood buyouts. Depending on site-specific conditions, where acquisitions eliminate the risks to homes, the levees could be setback or removed. (Cedar River, Unincorporated)
10.0	10.35	L	<b>Belmondo:</b> This reach contains one of the only unconfined areas within which the river regularly shifts channel location across a wide band of active floodplain. A home located on a terrace above the channel is at risk from channel migration and erosion that could undercut the terrace. (Cedar River, Unincorporated)	N	See potential project alternative description above.
10.65	11.00	L	<b>WPA:</b> The WPA levee reduces the risk of channel migration and provides a minimal level of protection from overbank flooding to five homes on the left bank which are located in the floodway and what appears to be an area of severe channel migration based on preliminary findings of the channel migration zone study currently underway. The levee also constricts flow conveyance through this segment, where a mobile home park on the opposite bank is regularly inundated by flood flows. The levee's bank armor also inhibits establishment of adequate stream buffer in the vicinity of some of the highest quality instream habitat in the lower Cedar River. (Cedar River, Unincorporated)	N	<b>WPA:</b> One alternative solution through this area could involve exploring options for setting back the banks to increase conveyance, independently or in combination with possible flood buyouts. Depending on site-specific conditions, where acquisitions eliminate the risks to homes, the levees could be setback or removed. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
10.75	11.10	R	<b>Cedar Grove Mobile Home Park Acquisition Project:</b> The Cedar Grove Mobile Home Park is located entirely within the floodplain as well as a high hazard overbank flood path of the Cedar River. Repeated flooding and damage of property and basic services has made this perennially one of the highest priority flood hazard risk areas in the basin. In 1990, flows overtopped the levee upstream, inundating the entire area, which caused the septic system to fail, contaminated the drinking water supply, cut-off the sole access in and out of the area, and damaged residents' homes. (Cedar River, Unincorporated)	Y	<b>Cedar Grove Mobile Home Park Acquisition Project:</b> Acquire the entire flood-prone property at fair market value; assist in relocating park residents; remove the homes and all associated structures; , and decommission and remove supporting infrastructure, such as the road, utilities, septic systems, and water supply wells. (Cedar River, Unincorporated)
11.1	11.5	R	<b>Rainbow Bend Levee and Residential:</b> The Rainbow Bend Levee was not built to provide 100-year flood protection, and provides neither sufficient freeboard nor a tie in to high ground at its downstream end. A row of nine single family homes is located behind the levee but still in the floodway, floodplain, and what appears to be the severe channel migration hazard area, based on preliminary findings of channel migration zone mapping in progress for the Cedar River. The levee is regularly overtopped and damaged, causing substantial flood damage and safety risks to the residents, including inundation and structural damage to homes, wells, outbuildings, and the sole access road serving the neighborhood; deposits of wood and rock debris; personal property loss; and temporary displacement. The levee itself severely constrains channel conveyance, directing high velocity flows into the opposite bank where an over-steepened levee is the sole protection for the Cedar River Trail and the Maple Valley Highway (SR-169). In addition, the Rainbow Bend levee is a barrier between the river and its historic floodplain, preventing natural river processes, and the rock blanket covering the levee's banks prevents the establishment of a healthy riparian buffer. (Cedar River, Unincorporated)	Y	<b>Rainbow Bend Levee Setback and Floodplain Reconnection:</b> Once acquisition of the flood-prone properties immediately behind the levee is complete, the levee can be setback or removed to provide greater accommodation of flood conveyance and natural riverine processes within the extensive floodplain currently cut-off from the river. The project will extend along ¾ mile of the mainstem Cedar River starting at Cedar Grove Road Bridge and proceeding downstream. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
11.50	11.7	L	<b>Cedar Grove Road:</b> High velocity flows overtop the MacDonald levee on the left bank, threatening several homes and their sole access road. At the downstream end of this segment, Cedar Grove Road cuts across the flow path of heavy overbank flooding through this neighborhood. Portions of the roadway are on a raised prism, making it susceptible to damage and causing backwater effects through the neighborhood. Flows over the lowest section of the roadway drop off a steep shoulder grade at the downstream edge before re-entering the river, leading to road washouts and closure of a major transportation connection. (Cedar River, Unincorporated)	N	<b>Cedar Lower Lions:</b> A solution to this flood problem is likely to involve purchase of repetitive loss properties as well as adjacent flood-prone homes and parcels. Opportunities could then be pursued to reconfigure or remove the levee to reduce channel confinement and reconnect flows in the river with the flows across the floodplain. Modification of Cedar Grove Road and the overbank flow path through the upstream neighborhood should be explored to address the backwater behind the road and allow overbank conveyance to re-enter the river. (Cedar River, Unincorporated)
11.7	13.15	L	<b>Byer's Bend/Cedar Grove Road:</b> At the upstream end of the reach, the Byer's Bend levee on the left bank is overtopped at moderate to high flows. Overbank flow leaves the main channel and cuts across a residential neighborhood, placing homes and sole access drives at risk. Mid-reach, an active landslide on an outside bend of the right bank regularly contributes substantial deposits of gravel and sediment to the river. Immediately following a slide, the material restricts conveyance in the mainstem channel. The restriction is typically temporary because the river transports the material as suspended sediment and bedload, but a large landslide could force the river out of its banks and through the neighborhood. (Cedar River, Unincorporated)	Y	<b>Cedar River Residential Flood Hazard Mitigation Analysis:</b> Home buyouts appear to be one of the most feasible and effective solutions in many of these high hazard areas, but the magnitude of impact of such a solution on both the community and existing flood hazard management resources is significant. Therefore, recommendations for these areas warrant further consideration. A range of flood hazard management alternatives for this area should be developed and evaluated to determine the most prudent course of action. The analyses should consider the flood risk, especially for residential developments; the level of protection provided by existing flood protection facilities; options for facility modifications or retrofits; and the impact of those facilities on flooding and habitat use in the vicinity. (Cedar River, Unincorporated)
13.0	13.45	L, R	<b>Jan Road - Rutledge Johnson Levee Setback:</b> The Jan Road levee, on the right bank of the Cedar River, and the Rutledge-Johnson levee, on the left bank of the river, constrict flood flows and increase flow velocities through this reach. This constriction directs the full force of the river downstream, across the channel and into the Cedar River Trail Levee. The integrity of the trail levee is essential to flood protection for this regionally-significant trail system and the adjacent Maple Valley Highway (SR-169). A major bank failure at the Cedar River Trail Levee was repaired	Y	<b>Jan Road-Rutledge Johnson Levee Setback:</b> Initial project actions will involve design of a flood protection facility retrofit for both the Jan Road and the Rutledge-Johnson levees to reduce the channel constrictions and associated high velocities. The initial design phase for the project will evaluate various alternatives that may include removal or setback of levee segments at the downstream end of each flood protection facility. The principle objective will be to allow higher flows, and the associated erosive energy, to be spread out and dissipated over a larger area of

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
			<p>following the floods of 1995 and 1996; however, this over-steepened levee could not be reconstructed to a more stable slope angle due to its proximity to SR 169. The repaired flood protection facility, therefore, remains over-steepened and vulnerable to future damage.</p> <p>Neither the Jan Road nor the Rutledge-Johnson Levees were designed to provide 100-year flood containment, nor are they tied off to high ground at either their upstream or downstream ends. As a result, the properties behind them are subject to flooding from water coming over the top of the levees as well as around the upstream and downstream ends. The upstream sections of both the Jan Road and Rutledge-Johnson levees do serve important flood protection functions; they reduce the frequency and severity of overtopping and prevent migration of the river channel. However, while the levees contain small floods, overtopping and flooding can occur during larger events, affecting several homes in the immediate vicinity. In addition, Taylor Creek, which enters the river at the upstream end of the Jan Road levee, can exacerbate flooding behind the Jan Road levee. Floodwaters from this location can flow across Jan Road, and through the neighborhood before re-entering the river further downstream. Toward the downstream ends of both the Rutledge-Johnson and the Jan Road levees, the areas immediately landward of the levee are undeveloped floodplain. At these locations the two flood protection facilities unnecessarily direct the flow into the Cedar River Trail Levee, and separate the river from its floodplain. In addition, the levees are not designed to current standards; their rip-rap slopes sit at a relatively steep angle right at the river's edge, resulting in a poorly vegetated riparian zone that is vulnerable to erosion and scour. (Cedar River, Unincorporated)</p>		<p>the floodplain, thereby reducing flood damages to the levees themselves and the Cedar River Trail levee. Engineering analyses will be used to determine the dimensions and alignment of the removal or setback alternatives in order to achieve the desired flood conveyance improvements without creating any undesirable flood risks to neighboring homes and properties. Communication with local residents will take place both formally and informally during the project's design development and implementation phases to provide an opportunity for them to be involved and informed. Results of the design development phase of the project may indicate that additional property easements or ownership are needed to fully achieve the proposed conveyance and floodplain reconnection improvements as recommended. King County will work cooperatively with adjacent property owners, to acquire conservation easements or other property interests, or to modify designs, as needed. (Cedar River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
13.75	14.05	L	<b>Rhode Levee Setback and Home Buyouts:</b> Erosion, scour, and lack of containment along the Rhode levee allows fast and deep flows to overtop the banks and flow through the adjacent residential neighborhood and across SE 203rd Street. The flood protection facility, the homes, and the roadway have all required regular repair and maintenance due to flood damages. With levees flanking both banks for approximately 1600 linear feet, the river is severely constricted through this reach. This confinement leads to an increase in localized scour velocities and flood elevations, exacerbating flood damages and risks to the flood protection facilities as well as the surrounding residential properties. The Rhode Levee also separates the river from its floodplain and disrupts the natural floodplain processes and interactions. (Cedar River, Unincorporated)	Y	<b>Rhode Levee Setback and Home Buyouts:</b> Project designs for reducing flood damage and loss behind the Rhode levee will need to give consideration to projects planned for the Getchman Levee on the opposite bank. The hydraulic model may need to be updated to reflect the new topographic conditions, and the results evaluated to determine the impact on flood hazards and future projects in the vicinity. Homes in the highest hazard areas should be acquired and the structures removed from the floodplain. Following acquisition of these flood-prone homes, and as part of a long-term flood hazard management strategy, channel conveyance should be expanded to safely accommodate flood flows while protecting SE 203rd Street and the remaining homes from any increased flood risk. This may be accomplished by setting back the levee or by constructing a conveyance channel through the floodplain. (Cedar River, Unincorporated)
13.75	14.05	R	<b>Getchman Levee Setback and Floodplain Reconnection:</b> The Getchman levee was built to prevent bank erosion and channel migration toward several homes and a section of Maxwell Road. The two most severely flood-prone homes located behind the Getchman levee have been acquired and removed. The levee, in combination with the Rhode levee on the opposite bank (see Rhode Levee Setback and Home Buyouts), severely constricts flood conveyance through this reach. This type of channel confinement tends to increase localized scour velocities and flood elevations, increasing the frequency of overtopping and exacerbating flood damages and risks to both the flood protection facilities and the surrounding residential properties. Both levees overtop at moderate flows, surrounding a number of the homes on the opposite bank by deep and fast flows. In addition to these flood impacts, the Getchman Levee disconnects the river from its floodplain, an historic oxbow channel, and the lower end of Taylor Creek, diminishing the ability of the river and its buffer to provide valuable habitat. (Cedar River, Unincorporated)	Y	<b>Getchman Levee Setback and Floodplain Reconnection:</b> The Getchman Levee should be set back to reconnect the river with its floodplain order to establish a greater area for flood conveyance and natural floodplain processes. The setback should be designed to maintain protection for Maxwell Road while opening up access for flow in the floodplain where homes have been removed or are sufficiently setback from the riverbank. A hydraulic model should be updated to reflect the new topographic conditions, and the results evaluated to determine the impact on flood hazards and future projects in the vicinity, such as along the Rhode Levee on the opposite bank. The one remaining home located behind the levee may still be at risk from flooding, and should be considered for acquisition as part of a long-term flood hazard management strategy. (Cedar River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
14.05	15.10	L, R	<b>Royal Arch:</b> Numerous homes occupy the wide floodway and floodplain covering the right bank through much of this segment. Along the left bank at the upstream end of this segment, a row of homes lines the river margin and is almost entirely within the floodway. In the middle and downstream portion of this reach the left bank is dominated by an active landslide that contributes a substantial amount of hillside material to the river. A major landslide from this steep slope could block all or portions of the river, placing the homes upstream and across the river at even greater risk from overbank flooding. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.
15.10	15.25	R	<b>Bain Road:</b> This stretch located between the SR-169 and SR-18 bridges has been identified as repetitive loss for two of the three developed properties in this area, all of which are outside the floodway but within the floodplain. Constriction of flows caused by the embankments under the SR-18 bridge at the downstream end of this segment may contribute to the recurrent flood damage. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.
15.8	15.8	R	<b>Banchero Revetment:</b> The Banchero Revetment is a riprap armored bank designed to reduce erosion and scour along an outside bend of the river in the vicinity of several homes. The flood protection facility does not prevent overtopping, but rather reduces the likelihood of channel migration that could cut off the sole access to the neighborhood or undermine the homes closest to the river. In addition, the close proximity of several of the homes to the river also prevents establishment of a healthy riparian buffer. The flood protection facility was damaged during the 1995-96 floods, but repairs could not be completed prior to close-out of disaster repair funding. The damage includes erosion and scour to the existing riprap bank, leaving the bank vulnerable to further damage. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.25	16.3	L, R	<b>Dorre Don Side Channel:</b> This area contains relatively dense residential use in areas of deep and fast flow. Flows overtop both leveed and unleveed sections at moderate flood events. The area is typified by wide meander bends and active side channels, and is subject to severe channel migration and avulsion hazards, which can flood homes or cut-off access. (Cedar River, Unincorporated)	Y	See <b>Cedar River Residential Flood Hazard Mitigation Analysis</b> .  <b>Dorre Don/Dorre Don Meanders:</b> One alternative solution through this area could involve exploring options for purchase of flood prone homes. Depending on site-specific conditions, where acquisitions eliminate the risks to homes, existing levees could be setback, modified, or removed in order to reconnect areas of the floodplain with the river, improving conveyance as well as restoring off-channel habitat. (Cedar river, Unincorporated)
16.3	17.00	R	<b>Lower Dorre Don:</b> The right bank through this area contains relatively dense residential use, almost entirely within the floodway or the area that appears to be the severe channel migration hazard area, based on preliminary findings of the channel migration zone study currently underway. The entire right bank is hardened by rock-lined flood protection facilities which prevent channel mobility and create an inadequate stream buffer. Flows overtop the banks at moderate flood events, sometimes transporting and depositing substantial amounts of large woody debris. Several homes have been elevated, possibly above the base flood elevation, reducing but not eliminating overall flood risk. However, these elevations do not reduce the risks from debris build-up against the structures or from access cut-off due to fast and deep flows through the neighborhood. (Cedar River, Unincorporated)	Y	See <b>Cedar River Residential Flood Hazard Mitigation Analysis</b> . Also, see potential project alternative description above.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.00	17.60	R	<p><b>Orchard Grove:</b> A continuous line of homes along the right bank are located in severe flood hazard areas. These homes are subject to flooding due to both inundation and erosion. Along the upstream portion of this segment, all but a few of the homes are in the floodway, but the extent and frequency of overbank flooding has been reduced for relatively minor floods by the Orchard Grove Levee. However, this flood protection facility does not provide protection for higher flows, nor does it tie into high ground at its downstream terminus, so even the homes behind the levee remain susceptible to overtopping and backwater flooding. While the benefits are limited, the flood protection facility does remain largely intact, and due to growth of riparian vegetation along the banks, the downstream end of the flood protection facility has started to accumulate a sand and gravel bar along the channel margin. This slows localized velocities, reducing risk of future scour or erosion along the bank. In the downstream portion of this segment, the homes are largely located outside the floodway, but are in the floodplain as well as the area that appears to be the severe channel migration hazard area, based on preliminary findings of the channel migration zone study currently underway. These homes are at risk from both overbank flooding and back erosion. Fortunately, the sole access road for the entire area is just outside the boundaries of these severe flood hazards. (Cedar River, Unincorporated)</p>	N	<p><b>Cedar Orchard Grove:</b> One alternative solution through this area could involve exploring options for purchase of flood prone homes. Depending on site-specific conditions, where acquisitions eliminate the risks to homes, existing levees could be setback, modified, or removed in order to reconnect areas of the floodplain with the river, improving conveyance as well as restoring off-channel habitat. (Cedar River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.60	17.85	R	<b>Cedar Trail Bridge at Orchard Grove:</b> Steep unstable slopes along the right bank have contributed to a somewhat dynamic channel in this reach, with active mid-channel gravel bar formations in several locations. A private road skirting the unstable hillside has experienced repeated damage due to landslide activity. Homes located on this road are at risk for loss of their sole access. The approach to the trail bridge remains forested and supports varied and beneficial habitat, but is at risk from erosion and scour which could undermine the bridge abutments. Collapse of the bridge would cause a major blockage in the river that could have devastating effects up and downstream. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.
18.50	20.10	L, R	<b>Arcadia-Noble:</b> Homes on both banks of the river are located in the area that appears to be the severe channel migration hazard area, the floodway, or both. Mid-reach, the Arcadia Revetment runs along a number of homes, including one repetitive loss property, reducing flood risk due to channel migration and inundation during moderate flows. However, the flood protection facility does not provide containment or 100-year protection. This reach of the river also contains numerous landslide-prone hillsides. One slide site, at the apex of a tight meander bend, contributes an estimated 1600 cubic feet of material annually. Several other slide areas are evident through the reach, any of which could cause a blockage of the river. The riparian buffer is absent or disconnected from the river along the length of the levee alignment. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
20.10	20.35	L, R	<b>Below Landsburg:</b> Two revetments are located along undeveloped portions of the river on publicly owned lands. These flood protection facilities were probably originally constructed to prevent channel migration or avulsion that might adversely affect the railroad, now the Cedar River Trail. The condition of these flood protection facilities is unknown largely because there are no structures other than the trail itself at risk in the vicinity, and because the adjacent lands are largely forested, providing limited access to them. The flood protection facilities, in combination with the trail, limit conveyance and storage as well as off channel habitat and natural river processes. (Cedar River, Unincorporated)	N	Feasibility and technical analysis required.

**Green River (WRIA 9)**

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
NA	NA	L,R	<b>Green River Flood Study:</b> On portions of the Green River, survey data is over 30 years old, cross sections are spaced over a mile apart and the contour interval of the topographic maps is up to 5 feet. In some reaches of the river, the channel has laterally migrated since the data for the existing flood study was collected. Major commercial, industrial and residential developments, situated behind levee systems in the lower reach, have occurred throughout the basin since the floodplain maps were produced. A new flood study for the Green River from River Mile 5 to River Mile 45 was initiated in early 2006 and is partially funded with a grant from the Washington Department of Ecology. (Green River, Unincorporated, Cities of Auburn, Kent, Tukwila, Renton)	Y	<b>Green River Flood Study:</b> Prepare flood study and corresponding FEMA Flood Insurance Studies and Flood Insurance Rate Maps for the Green River. (Green River, Unincorporated, Cities of Auburn, Kent, Tukwila, Renton)
5.4	5.9	L	<b>Boeing Oxbow:</b> Boeing employee parking lot, recreational center, and trail sit at edge of steep, eroding bank. Partial rip-rap repairs, older debris (car chassis), and slumps are present. Vegetation is sparse, non-native, and inadequate to stabilize slopes. Revetment toe is founded on deep, soft mud deposits, which are also subject to shifting, slumping, and erosion, with little large woody debris structure present. Buffer width is uniformly inadequate. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District, establishes stable slopes, restores native vegetation, and provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.46	6.10	R	<b>Boeing Right / S 104<sup>th</sup> St / E Marginal Way:</b> Both the upstream and downstream thirds abut industrial and commercial properties, including Boeing Company parcels. The central third of this segment forms the road shoulder embankment of E Marginal Way S. Some older riprap and more recent rip-rap repairs constructed by the City of Tukwila are present along E Marginal Way S and S 104 <sup>th</sup> St. Slopes are steep, erosion and slumping are visible, the toe structure is questionable and the vegetation is limited to the riverbank itself and is dominated by blackberries with scattered, immature deciduous trees present in a few locations. Industrial properties in the upstream third of the segment border over steepened slopes with substantial debris and rubble fills forming the embankment. Parking lots, roads and commercial structures are located at the top of bank. Space for a vegetated buffer area is absent. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
5.9	6.14	L	<b>Boeing/ Postal Service:</b> Partially treed slopes border narrow ledge of salt-tolerant sedges and mud deposits along the aquatic edge. Debris (decaying catamaran) is present. Slopes are steep; buffer width is inadequate in places. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle).

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.10	6.29	R	<b>Site #1:</b> Older industrial and rubble fills are being removed and floodplain wetland habitat, including salt marsh, is being restored. The existing depositional sediments along the channel edge support one of the few remaining strips of salt marsh vegetation in the lower Duwamish River. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle).
6.14	6.21	L	<b>City Light/Postal Parking:</b> Steep, older rip rap flood protection facility (City Light) borders edge of deep pool formed D/S of North Winds' Weir. Toe slope is unstable; slope is too steep, invasive vegetation is present, parking lot crowds inadequate buffer width. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)
6.21	6.28	L	<b>Cecil Moses Park:</b> Steep, older revetment with invasive vegetation and some tree cover borders rock outcropping at North Winds' Weir. Park include constructed off-channel connection to river, but only connects at high flows or high tides. Lower slopes are slumping and eroding, toe structure appears inadequate. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.28	6.29	L	<b>Rubber Tire Revetment:</b> Steep, bizarre rubber tire pile covers the riverbank at a City of Seattle waterline crossing location. Concrete restraining structure at pipeline location would require relocation to allow slopes to be reconstructed in a stable and environmentally responsible manner. Truly a wonder of the lower Green River. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)
6.29	6.54	R	<b>Boeing / Old Duwamish Drive-In:</b> The river bank here was reconstructed at a 2H:1V slope angle in connection with construction of the office towers at this site. A single row of non-native poplars was retained along the top of bank and the reconstructed slope was planted with in an attempt at biostabilization. Unfortunately, these efforts were largely unsuccessful due to initial use of plantings imported from Montana. Additional native vegetation has since colonized portions of the bank. Unconsolidated sediments deposits along the channel edge form a broad shallow shelf along the toe of the slope. Large woody debris placed during bank reconstruction is also present. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)
6.3	6.55	L	<b>SR 599 embankment:</b> Steep, unstable rip-rap slope covers riverbank along shoulder of SR-599. Minor amounts of invasive vegetation are present. Soft mud deposits along the toe slope are apparently restrained by the remnants of a series of old wooden pilings. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.54	6.83	R	<b>Gateway Lowest Right:</b> This steep eroding and slumping bankline shows no evidence of previous stabilization measures. A narrow shelf of unconsolidated sediments forms the toe slope along the channel edge. Scattered immature non-native trees are present. The bank vegetation is dominated by blackberries and reed canary grass. Commercial structures and parking lots are present just landward of the top of bank. No functional vegetative buffer area is present. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)
6.55	6.83	L	<b>Gateway North (Lowest):</b> Bank has been reconstructed with a midslope bench supporting a City of Tukwila Trail. Lower slopes have been revegetated above the tide line, with varying success. Some invasive species are present. Toe slopes are composed of soft mud, which forms a narrow bench supporting a band of salt-tolerant sedges along the aquatic edge. A slump has developed at the upstream end of this reach, near a culvert outfall, apparently as a result of recent Sound Transit Light Rail construction activities. (Green River, City of Tukwila)	N	<b>Duwamish Revetment Setbacks and Shallow Water Habitat Creation:</b> Revetment setbacks, bank restoration, and shallow water habitat creation. Rehabilitates steep, older, deteriorating revetments, some of which are within the Green River Flood Control Zone District; establishes stable slopes, restores native vegetation, provides opportunity for shallow water habitat creation. Channel edge habitat creation will include reconstruction and stabilization of substandard toe buttress structures serving existing maintained facilities. (Green River, Cities of Tukwila and Seattle)
6.83	7.5	L	<b>Interurban South /Residential:</b> Steep, generally poorly vegetated slopes adjoin houses and back yards, are slumping in places, and include a number of bank modifications such as boat haul-outs, rubber tire revetments, and other homeowner improvements. Toe slopes are founded in soft mud with a surprising amount of apparently natural imbedded large woody debris. Some native species are present. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.83	7.90	R	<b>S 115<sup>th</sup> St / 42<sup>nd</sup> Ave S:</b> Paved streets (some of which lack road shoulders) are located at the top of bank in many portions of this intertidal segment. A high pressure water main is located at the top of bank in the road shoulder along portions of 42 <sup>nd</sup> Ave S. Several previous slumps have been repaired with large rock toe structures and biotechnical stabilization measures, including the 42 <sup>nd</sup> Ave S bridge abutment at the upstream end. Large woody debris was installed at several previous repairs sites, and has locally induced sediment deposition the toe of the slope. A narrow band of both native and non-native trees, many of which relatively mature, is present in some locations. Continued settlement of the bank and cracking of the asphalt road pavement is evident. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
7.5	7.9	L	<b>Tukwila Trail /Banchero Left:</b> Paved City of Tukwila Trail follows old rail grade along the bank. Slopes are covered with large, older rip-rap placed by RR. Maturing native deciduous trees are present throughout, though a bit sparse in density of coverage, with minimal under story or overhanging vegetation along the channel. Toe slopes are founded on heavy rip-rap deeply imbedded in soft mud. Minor large woody debris is present along the aquatic edge. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
7.9	8.9	L	<b>Codiga Left /Gateway Lower &amp; Upper /Seattle-LA Freight:</b> The Tukwila Trail system sits immediately next to the top-of-bank, adjoining parking lots and commercial properties. The bank is steep, covered with some rip-rap in places, especially near the upstream end, and slumping in several places, especially near the downstream end, where rip-rap is largely absent. A narrow strip of native vegetation is present on the steep revetment slopes, along with invasive vegetation. Other than the steep, slumping and eroding bankline, there is no buffer, and the aquatic edge lacks large woody debris or other habitat structure. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.90	9.00	R	<b>Banchero Right / Tukwila Community Center / S 125<sup>th</sup> St / Codiga Farm / Steel Hill Bridge / 9.6 Revetment Right:</b> This segment includes an older riprap revetment and riprap fills that cross the river over a King County sewer line, an asphalt trail along the channel edge at the Tukwila Community Center, a steep, riprapped road shoulder embankment along S 125 <sup>th</sup> St, several residential properties bordering the top of bank, an off-channel constructed wetland in Codiga Farm Park and an additional steep riprap embankment bordering 50 <sup>th</sup> Pl S. The Community Center trail is occasionally submerged during exceptionally high tides and high flows, or both, and is bordered by a very thin strip of native willows, with a few pieces of large woody debris embedded in the riprap toe. Where riprap embankments are present, they are steep, the toe structure is questionable and local evidence of slope settlement and erosion is visible. The residential properties also border steep river banks, with some riprap present. Blackberries dominate the slope cover along these parcels; a few trees are also present. Overbank flooding does not occur along this portion of the segment. Except within the Codiga Farm Park restoration site, no vegetated buffer area is present, and even within the park, the bank is heavily armored by riprap and covered by blackberries. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
8.9	9.4	L	<b>I-5 /Interurban Ave. S:</b> The I-5 freeway, the adjacent Tukwila Trail, a warehouse and parking lot, and Interurban Avenue crowd a narrow buffer, which is completely absent in some locations. Next to the warehouse, the river bank is occupied by a vertical steel sheetpile wall, which replaced an earlier, failing log crib-wall. Steep rip-rap slopes abut Interurban Avenue So. Slopes are steep, prone to slumping, poorly vegetated, and founded on questionable toe structures along a truncated outer bend. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
9.00	9.75	R	<b>Allentown:</b> A number of residential properties border steep eroding banks. A hodgepodge of individual attempts at bank stabilization include at least one rubber tire revetment. Yard setbacks from the river vary in width, and some mature cottonwoods are present. Overbank flooding does not occur at this location. Bank erosion and slumping are evident, including the occasional recruitment of cottonwoods into the channel. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
9.4	10.55	L	<b>Foster Golf Course (Foster Lower, Middle, and Upper):</b> A narrow strip of native and invasive vegetation borders golf course tees, fairways, and greens. Some portions of the bankline are covered with poorly vegetated rip-rap, and some portions of the bank are actively eroding and sloughing. Localized flooding is possible at higher flows. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
9.75	10.40	R	<b>Rendering Works Lower and Middle / Railroad Embankment:</b> A surprisingly wide vegetated buffer area is present around the edges of a small inside meander bend occupied by the Seattle Rendering Works. Older riprap revetments are present along the access road downstream and along the railroad embankment upstream. A narrow band of trees and shrubs has established on these embankments. Trees are also present at the Rendering Works site as well. Under story areas remain dominated by blackberries. The toe structure is questionable throughout. The banks remain locally steep and minor erosion and slumping is visible in places. Overbank flooding has not been observed at this location. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
10.40	11.10	R	<b>Foster Golf Right / King County Sewer / Railroad Embankment:</b> Steep banks with areas of riprap armor border a small inside meander bend occupied by part of Tukwila's Foster Golf Course. Downstream from RM 10.9 this segment borders a railroad embankment. A narrow band of trees has established in places along the railroad embankment and portions of the golf course. Most recently, a dense stand of immature alders has colonized the bank near RM 10.80 following disturbance in connection with a King County sewer line installation. A surprising quantity of large woody debris is locally present near RM 10.70. Overall, most of the riparian buffer area is occupied by greens, Ts and fairways. Blackberries cover much of the river bank, especially where riprap is present. The toe structure is questionable throughout the golf course, but likely adequate along the railroad embankment. The mouth of the Black River is present at the upstream end of this segment. A small depositional area on the right bank at this confluence is also covered with blackberries. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
10.55	10.7	L	<b>Riverside Inn /Candy Factory /Casinos:</b> A rip-rap extension of the Foster Upper revetment is heavily colonized with younger deciduous and invasive volunteer vegetation at the downstream end, with a partial concrete floodwall transitioning to a rip-rap cover over a rusting steel sheetpile wall behind the old Riverside Inn near the upstream end. Slopes are steep, toe structure is questionable, buffer widths are narrow to absent, vegetation is discontinuous and poorly established in places, and poorly maintained overall. Local flooding of the parking lot at the Riverside Inn occurs at higher flows, and adequate freeboard is also discontinuous. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
10.7	11.12	L	<b>Tukwila Trail:</b> The Tukwila Trail is setback from the river along a stormwater swale occupying a midslope bench with a row of mature cottonwoods at the lower end of this reach. The trail more closely abuts the bank in upstream areas, and previous slumping is present right up to the trail edge in at least one location. The bank is generally steep, but some naturally occurring large woody debris is present near the downstream end, and vegetation is surprisingly dense in several locations. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
11.10	12.16	R	<b>Fort Dent / Railroad Embankment:</b> A steep levee with older riprap armor present in places borders Fort Dent Park up to RM 12.00. A railroad embankment forms the river bank upstream of this point. A narrow band of vegetation, including some deciduous trees has established along the railroad embankment, although the under story is composed predominantly of blackberries. As this embankment constitutes a truncation of a former outer meander bend, it may be presumed that the toe structure here is adequate. The toe structure throughout the Fort Dent Levee, on the other hand, is visibly eroded, undercut and otherwise inadequate. Slumping up to and including the levee crest access road has been observed near RM 11.25 and 11.76. A row of mature trees has established in the vicinity of the Fort Dent Park access bridge. Other than this an insufficient riparian buffer area is present. Overbank flooding does not occur in this reach. (Green River, City of Tukwila)	N	<b>Fort Dent Levee Setback at RM 11.1 to 12.0:</b> Rehabilitate the steep, eroding, and slumping levee to a stable angle of repose with a midslope bench/buttress, and improve flood storage and conveyance capacity along Fort Dent Park. Restore the failing toe buttress structure and rehabilitate aquatic habitat along the channel edge with large woody debris placement. Replant the riverbank and midslope bench areas with native trees and shrubs to restore riparian habitat conditions. (Green River, City of Tukwila)
11.12	11.72	L	<b>Interurban /Maule Ave. Commercial:</b> One vacant commercial lot and a variety of commercial, industrial, office and hotel properties and parking lots abut a steep, eroding, sloughing riverbank with a narrow strip of varied vegetation, including both native and invasive species. Rip rap and a raised levee structure are present near the upstream end, but largely absent near the downstream end. Freeboard is variable and inadequate in places. Toe structure is questionable. A rock outcropping is prominent within the channel, along the left bank near the upstream end. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
11.72	12.39	L	<b>Fiorito /Tukwila Bend:</b> A steep, rip-rap covered slope generally overgrown with blackberries has been excavated to form a midslope bench supporting some native vegetation in several locations. Localized erosion and slumping is present in places, with minor sand deposits on some lower slopes in the center of the bend. A paved trail is present at the top-of bank, with a minimal buffer in places. Some mature cottonwoods are also present. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
12.16	12.60	R	<b>Family Fun Center / 5 Bridges:</b> An off-channel pond connects to the river at the downstream end of a vegetated mid-slope bench and 2:1 slope adjoining the Family Fun Center. Five bridges occupy the remainder of this segment. Small areas between the bridges include some riprap armor and a stormwater-biofiltration facility for the nearby I-405 interchange. Native vegetation was planted on the constructed bench and slope of the Family Fund Center and in the biofiltration swale. The remainder of the slopes are deeply shaded by the bridges or covered by blackberries. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
12.4	12.57	L	<b>White Swan Left:</b> Varied levels of native and invasive vegetation cover a very steep, locally eroding and slumping slope along the edge of a paved trail. A high pressure waterline is also present in or near the trail. A previous repair of a slope washout due to earthquake-induced waterline failure is present near the downstream end, with native willow layers and other plantings placed in live geogrid layers. Toe structure remains questionable. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
12.6	12.8	L	<b>Tukwila 205 /Christensen Road:</b> A paved trail and Christensen Road abut a locally steep riverbank largely covered with blackberries. Toe structure remains questionable. Portions of Christensen road are supported on the riverbank with gabion baskets. Local settling is present, as evidenced by separation of a jointed concrete outfall pipe. A 90" iron flapgate at the confluence of Gilliam Creek, near the downstream end, has previously stuck open due to entrainment of large woody debris from upstream. This outfall pipe is not screened to prevent debris accumulations, the flapgate impairs fish passage, and there is no backup closure device present. Local interior flooding occasionally needs to be pumped out of street manholes into the river during high water events. (Green River, City of Tukwila)	N	<b>Gilliam Creek at RM 12.65:</b> Replace a 9-foot diameter iron flapgate on a concrete splash apron at a federal levee to maintain flood containment, with a fish passable structure, and rehabilitate Gilliam Creek. (Green River, City of Tukwila)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
12.60	13.30	R	<b>I-405 / Best Western (Nendel's) / SR-181 / Homewood Suites / Strander Bridge / Burnaby's:</b> The downstream end of this segment includes levees built in connection with the relocation of the Green River during construction of I-405. A small relict portion of the original channel is present behind the levee together with two hotel properties. The levee here is steep, armored with riprap and includes rubble near its upstream end. A few cottonwoods are present where it joins SR-181, also known as the West Valley Highway, and adjacent to I-405. The toe structure is questionable throughout this segment, and the levee face is dominated by blackberries. Two single family homes are present near RM 13.00 and RM 13.30, respectively, with small lots that are heavily vegetated with exotic species, including bamboo. Localized flooding of these properties has been observed. The rest of this reach consists of a small inside meander bend adjoining the Homewood Suites hotel units downstream from Strander Bridge and Burnaby's restaurant just upstream from Strander Bridge. A well vegetated riparian buffer is present along both of these sites, with a few mature deciduous trees also present on the bank behind the parking lot at Burnaby's. The banks are locally steep, and erosion and slumping have been observed. (Green River, City of Tukwila)	N	<b>I-405 Levee Side Channel Reconnection at RM 12.6 to 12.7:</b> Breach or set back the steep, eroding levee, and increase flood storage and conveyance capacity. Re-connect the abandoned river channel to the existing mainstem as a side channel habitat area. Stabilize and rehabilitate the channel edge with large woody debris installations, and restore riparian and wetlands habitat areas with native tree and shrub plantings. (Green River, City of Tukwila)
12.8	12.95	L	<b>Tukwila 205 / Van Warden Park:</b> The levee here is setback from the channel behind a low, wide floodplain bench covered with mature cottonwood groves and blackberries. A paved trail is also present. Various restoration actions have been proposed at this site. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
12.95	13.2	L	<b>Tukwila 205 /Van Warden:</b> A paved trail sits on the levee crest at the edge of a relatively steep slope. Toe structure is questionable. Vegetation varies from invasive blackberries, to willow plantings in rip-rap stabilizing a pipeline crossing, to a few deciduous trees and mixed native and invasive shrubs, to a recently constructed stormwater outfall near Strander Bridge, which is stabilized with willow cuttings and other native plantings in live geogrid layers. Two pieces of installed large woody debris are imbedded into the bankline, right at the outfall. The levee and trail abut closely placed commercial and office buildings and parking areas, with no buffer present. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
13.21	14.45	L	<b>Tukwila 205 /Christensen Road:</b> The levee here is locally very steep, and overall toe structure is highly questionable. In some locations floodplain benches with some stands of native deciduous trees are present. Most of the reach is composed of rip-rap with blackberries and reed canary grass. Upper and midslope areas are mowed annually. Two large slumps near the upstream end have previously been repaired with large rock toe structures and willow cuttings placed in live geogrid layers. Minor amounts of large woody debris were also imbedded into the bankline at one repair location. The levee and trail abut commercial structures and parking lots, including Costco and Home Depot. The P-17 Pump Station, storage fore bay, and outfall through the levee are present in the central portion of this levee segment. Two feet of freeboard is present, with overall levee height some ten to twelve feet above the floodplain in places. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
13.30	14.65	R	<p><b>Nelson / N.C. Machinery / SR-181:</b> Industrial and commercial buildings, parking lots, and equipment storage areas occupy a small inside meander bend at the downstream end of this segment. Riprap repairs have been made to the upstream river bank at this location. Elsewhere, the channel edge follows the SR-181, also know as the West Valley Highway, road embankment. A few narrow floodplain benches are present, but most of the segment is characterized by older riprap, road shoulder steel and concrete retaining structures. Slope stabilization is discontinuous, the toe structure is highly questionable, and highly visible bank erosion and slumping are present. Except for a few isolated trees and a narrow band of native riparian trees and shrubs at the extreme downstream end of this segment, the bank vegetation consists almost entirely of a blackberry-reed canary grass biculture. A thriving stand of native willows covers the slope just upstream from the S 180<sup>th</sup> St bridge. These willows were installed as mitigation for widening of the bridge. Except for the riverbank itself, no riparian buffer area is present. The highway is at the top of bank through most of this reach. (Green River, City of Tukwila)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
14.47	15.02	L	<b>Tukwila 205 /Ratolo-So.180<sup>th</sup> St. Floodwall:</b> A paved trail sits at the top of a locally very steep bank covered with rip-rap, blackberries, and reed canary grass. The levee provides two feet of freeboard throughout. Overall levee height varies from about 6 to 10 feet above the floodplain elevation. Willow plantings are present near the downstream end, as part of the required mitigation for earlier widening the So. 180 <sup>th</sup> Street Bridge. Near the upstream end, So. 180 <sup>th</sup> Street abuts a vertical concrete floodwall forming the backside of the steep, rip-rap faced levee face descending from the trail edge to the bed of the river. Local scour and minor slumping are present throughout the downstream 2/3 of this segment. Toe structure is questionable throughout. Vegetation is lacking. There is no buffer along the parking lots and commercial structures present. (Green River, City of Tukwila)	N	Feasibility and technical analysis required.
14.65	15.60	R	<b>Desimone:</b> The downstream end of this segment includes a narrow levee crest and narrow, extremely over steepened and previously failed levee embankments. Near RM 15.00 the levee is set back somewhat from a depositional bench along a sharp inside meander bend. Between RM 15.30 to 15.60, the upstream end of this segment previous levee failure areas have been reconstructed with a mid-slope bench in a setback landscape position, buttressed with large toe rock, an abundance of large woody debris along the channel edge, and re-vegetated with recently planted native riparian trees and shrubs. Elsewhere, a narrow band of non-native trees is present on the existing levee back slope. The toe structure is questionable throughout these unrepaired areas and localized erosion and slumping is pervasive. The levee crest appears to provide two feet of freeboard above the base flood elevation. Protected areas are located about six to 12 feet in elevation below the levee crest. Blackberries and reed canary grass dominate the unrepaired levee slopes. Except for the recent levee repairs, no functional buffer area is present. (Green River, City of Tukwila)	Y	<p><b>Desimone Levee Project 1:</b> Incorporate reconstruction of this segment into a reach-length levee setback with acquisition of sufficient easement area for re-construction of riverward levee slopes at minimum 2.5H:1V slope angles. Reconstruct the levee toe, install large woody debris structures, excavate a mid-slope bench/buttress, and re-vegetate with live willow layers and native riparian trees and shrubs. (Green River, City of Tukwila)</p> <p><b>Desimone Levee Project 2:</b> Repairs to this levee segment should be incorporated into a reach-length levee setback with acquisition of sufficient easement area for re-construction of the levee at a minimum 2.5H:1V slope angle. The levee toe buttress should be reconstructed with installation of large woody debris structures, the excavation of a mid-slope bench/buttress re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be re-vegetated. (Green River, City of Tukwila)</p> <p><b>Desimone Levee Project 3:</b> Repair of this levee segment</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
					<p>should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for re-construction of levee slopes at a minimum 2.5H:1V slope angle. The levee toe should be reconstructed with using large woody debris structures and a mid-slope bench/buttress should be constructed. Upper levee slopes should then be stabilized. (Green River, City of Tukwila)</p> <p><b>Desimone Levee Project 4:</b> Repair of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for re-construction of the riverward levee slope at a minimum 2.5H:1V slope angle. This will require negotiations with the local landowners concerning vacation of the railroad spur line serving these warehouses. This project should include reconstruction of the levee toe, installation of large woody debris structures, excavation of a mid-slope bench/buttress, re-vegetated with live willow layers and native riparian trees and shrubs, stabilization of the upper bank. (Green River, City of Tukwila)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.02	15.2	L	<b>Tukwila 205 /Segale # 1:</b> A steep, eroding and slumping levee abuts a bank building, railroad spur tracks, and parking lots. These slopes are substantially steeper than recommended for stability during rapid drawdown conditions. No toe buttress structure is present along the channel edge. Beaver lodges have previously been observed within the levee toe. No slope armor or reinforcement is present. Vegetation is limited to a narrow band of snowberries, mixed with invasive blackberries and reed canary grass. Upper and midslope areas are mowed annually. A buried toe drain is located at the upstream end, along the landward portions of the levee, to prevent seepage, piping, foundation liquefaction, sand boils and hydrostatic uplift pressures which have previously been problems in this vicinity. A ring-dike was constructed in 1996 near the downstream end to impound seepage flows that developed during a record flood event. The levee provides two feet of freeboard throughout Levee setback repairs to this segment should be considered a top priority. (Green River, City of Tukwila)	Y	<b>Segale Levee Project #1:</b> Repair of this levee should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the riverward levee slope at a minimum 2.5H:1V slope angle. A levee toe buttress should be constructed that includes the installation of large woody debris structures and excavation of a mid-slope bench/buttress. The upper slopes should be stabilized. (Green River, City of Tukwila)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.2	15.45	L	<p><b>Tukwila 205 /Segale # 2:</b> Riverward slopes in this reach have generally been reconstructed at 2H:1V angles of repose during three previous repairs, with some oversteepening of rock toe buttress structures still present. These slopes remain slightly steeper than generally recommended for achieving factors of safety for rapid drawdown conditions, relative to the range of soil conditions likely present. Downstream portions were rebuilt by the Corps, and the face slope was armored with rip-rap, then covered with native soil and subjected to subsequent, natural deposits of flood-borne sediment. These slopes now support volunteer stands of native willows and other, immature, native deciduous species. Upstream portions were constructed by King County with large toe rock, imbedded large woody debris, and willow cuttings in live geogrid layers. Localized deepening of the riverbed at the channel margins dislocated portions of the toe rock in this area, and the damaged areas were then rebuilt with additional toe rock, anchored large woody debris flow deflectors, and new plantings of a variety of native riparian species. The landward levee toe has been rebuilt with the same buried toe drain as in the adjoining reach downstream, supplemented with a raised rock filter berm, and penetrated with a series of groundwater relief wells connected by a manifold and pumped to the river from a large collection manhole. These measures were taken to address extreme seepage, piping, foundation liquefaction, sand boils, and hydrostatic uplift pressures present in this area during several previous flood events. General filling of adjacent grades to further address these conditions has been undertaken by the landowner. The levee provides two feet of freeboard throughout. (Green River, City of Tukwila)</p>	N	<p><b>Segale #2 &amp; #3:</b> Future reconstruction of this levee should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the riverward levee slope at a 2.25H:1V slope angle. This action should be targeted to future redevelopment at this site location. The levee toe buttress should be reconstructed to include the installation of large woody debris structures and excavation of a mid-slope bench/buttress. The upper slopes should be stabilized with native vegetation. A landward toe buttress structure and seepage drain should be included in this future work. (Green River, City of Tukwila)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.45	15.61		<p><b>Tukwila 205 /Segale # 3:</b> The levee sits at an inside bend location with localized deposits of sediment present. This area has previously experienced extensive seepage, piping, saturation of the levee prism and sloughing of landward slopes, foundation liquefaction, and sand boils. These conditions were addressed with construction of a crushed rock filter buttress along the landward levee slopes, and a crushed rock fill cover over problematic seepage areas landward of the levee. Former problem areas of this kind have been further addressed with site fills placed by the landowner in connection with recent warehouse construction. Riverward slopes are generally less steep than in adjoining areas along this inside bend, but lack any toe buttress structure, slope armor covering, or other stabilization measures. Some minor areas of landscaping with immature, non-native trees are present landward of the existing levee access road, which could potentially be incorporated into a modest setback, given adequate easements. No other buffer is present. Vegetation is largely limited to invasive blackberries and reed canary grass. Upper and midslope areas are mowed annually. The levee provides two feet of freeboard throughout. (Green River, City of Tukwila)</p>	N	<p><b>Segale #2 &amp; #3:</b> Future reconstruction of this levee should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the riverward levee slope at a 2.25H:1V slope angle. This action should be targeted to future redevelopment at this site location. The levee toe buttress should be reconstructed to include the installation of large woody debris structures and excavation of a mid-slope bench/buttress. The upper slopes should be stabilized with native vegetation. A landward toe buttress structure and seepage drain should be included in this future work. (Green River, City of Tukwila)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.60	17.12	R	<p><b>Briscoe:</b> The downstream portions of this levee are set back from the river along an inner meander bend operated as a park by the City of Kent. The entire river bank in this segment is over steepened and covered with riprap armor, including the open space park area. An asphalt trail occupies the levee crest, and a lower trail parallels the bank in the park. Scattered cottonwoods, a mowed lawn and picnic shelters occupy the park. A single row of both non-native poplars and native cottonwoods lines the back slope of the levee between RM 16.20 and 16.40. A deep-seated slump passing through the levee crest has recently developed near RM 16.50. Toe structure is questionable throughout this segment. The overall slope stability is also questionable. Reconstruction of this levee will not be possibly without acquisition of additional easement area. Pronounced cracking of the asphalt trail on the levee crest at RM 17.05 may be due to root penetration by a single mature cottonwood on the landward slope. The levee crest elevation is not uniform throughout this segment, but likely provides at least two feet of freeboard above the base flood elevation. Landward areas are about six to eight feet in elevation below the levee crest. A concrete retaining wall along the trail underpass connects the upstream end of the levee to the S 200<sup>th</sup> St Bridge abutment. Except for an occasional willow, the river bank is dominated by blackberries and reed canary grass, and no functional riparian area is present except for the unrealized potential afforded by the Brisco Park. (Green River, City of Kent)</p>	Y	<p><b>Briscoe Levee Projects 1-3, 5-8:</b> Repair of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for re-construction of levee slopes at a minimum 2.5H:1V slope angle. The levee toe should be reconstructed with the installation of large woody debris structures, excavation of a mid-slope bench/buttress, revegetated with live willow layers and native riparian trees and shrubs. The upper levee slopes should also be stabilized. (Green River, City of Kent)</p> <p><b>Briscoe Levee Project 4:</b> Repair of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for re-construction of levee slopes at a minimum 2.5H:1V slope angle. The levee toe should be reconstructed with installation of large woody debris structures, excavation of a mid-slope bench/buttress, and re-vegetation with live willow layers and native riparian trees and shrubs. Upper levee slopes should also be stabilized. (Green River, City of Kent)</p>



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.61	15.9	L	<p><b>Tukwila 205 /Segale # 4:</b> The levee here closely abuts a large warehouse, access roadway, and truck loading area. The upstream portion abuts a smaller commercial structure with a large parking area. Grade elevations landward of the levee, adjacent to the warehouse, are raised sufficiently to prevent any levee-failure-related overflow down-valley into the rest of the Segale Business Park and Southcenter areas, but do not in themselves provide sufficient freeboard to qualify as containment structures. The upstream parcel grades are about 6 to 8 feet in elevation below the levee crest. The levee itself here provides a minimum of two feet of freeboard above the base flood. An 8 foot high chain link fence is preset in the upstream portions, placed immediately adjacent to the levee access road, well within the existing 30-foot wide easement area. This fence will prevent operation of hydraulic excavators from the access road, as insufficient area is present to swing the equipment around. This condition continues to preclude adequate mowing of this area with a rubber-tire mounted excavator, fixed with a mowing arm attachment. The balance of the levee's upper and midslope areas is mowed annually. Riverward levee slopes are extremely steep, ranging from about 1.7H:1V to about 1.3H:1V slope angles. This is far less than needed to achieve recommended minimum factors of safety against rapid drawdown or intermediate river stage modes of failure. Minor toe scour and surface erosion is also present. Toe buttress structure is questionable throughout. Levee slopes are covered with a thin layer of rip-rap-armor. Vegetation is dominated by invasive reed-canary grass and blackberries. A narrow row of non-native saplings has been planted along the landward edge of the access road, within the levee prism. No other appreciable tree or shrub cover is present. No vegetative buffer area is provided. Reconstruction of this segment to stable slope angles should be a priority of any projects for redevelopment of the existing site areas. (Green River, City of Tukwila)</p>	Y	<p><b>Segale Levee Project 4:</b> Stabilization of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the levee slopes at a 2.25H:1V slope angle. This action should be targeted to future redevelopment at this site location. A levee toe buttress should be constructed with large woody debris structures and excavation of a mid-slope bench/buttress stabilized and re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be stabilized. (Green River, City of Tukwila)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
15.9	16.04	L	<b>Tukwila 205 /Oak Harbor Freight:</b> The Levee here adjoins commercial structures and a freight-loading area. Riverward slopes are very steep, perhaps greater than 1.5H:1V in places, along a sharp outer bend. Large rip-rap is present at the toe of slope, and the face of the levee is covered with rip-rap armor, which shows some dislocation or erosion in places. Vegetation is dominated by invasive reed-canary grass and blackberries. Some local tree cover is present along the landward portions of this segment near the downstream end. Overall a buffer area is lacking or inadequate. Reconstruction of this segment to stable slope angles should be a priority of any projects for redevelopment of the existing site areas. (Green River, City of Tukwila)	N	<b>Oak Harbor at RM 15.9 to 16.1:</b> Stabilization of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the levee slopes at a 2.25H:1V slope angle. This action should be targeted to future redevelopment at this site location. A levee toe buttress should be constructed with large woody debris structures and excavation of a mid-slope bench/buttress stabilized and re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be stabilized. (Green River, City of Tukwila)
16.04	16.72	L	<b>Tukwila 205 /Gunter (“Carrot Patch”):</b> A formerly agricultural levee has been raised to provide 2 feet of freeboard above the base flood, and is included within the Tukwila 205 federal levee project. The levee continues to protect croplands at present, but this area has been proposed for redevelopment. The levee is noticeably steeper throughout than the 2.5H:1V slope angles generally needed to achieve the recommended factor of safety against rapid drawdown failure in type of soils present. Toe buttress structure is questionable throughout. Levee face slopes are covered with a thin layer of rip-rap armor. Slopes show localized scour and shallow slumping. Vegetation is dominated by invasive reed-canary grass and blackberries. No tree cover is present. A buffer area is lacking or inadequate. A year-round tributary stream has been entirely piped across the upper end of the site, and discharges to the river near RM 16.7. Reconstruction of this segment to stable slope angles should be a priority of any projects for development of the existing site areas. (Green River, Unincorporated)	N	<b>Gunter Levee Setback:</b> Rehabilitate existing Gunter Levee and Frager Road Levees with setback relocation, restore habitat and increase flood storage and conveyance capacity. Stabilization of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the levee slopes at a minimum 2.5H:1V slope angle. This action could be targeted to future development at this site location, and should definitely be included in any such action. A levee toe buttress should be constructed with large woody debris structures and excavation of a mid-slope bench/buttress stabilized and re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be stabilized with native vegetation. (Green River, City of Tukwila)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
16.72	17.11	L	<p><b>Tukwila 205 (Portion) and Frager Road Lowest (Portion):</b> The downstream third of this segment is part of the Tukwila 205 levee, and consists of raised portions of Frager Road, which provide 2 feet of freeboard over the base flood elevation. A raised access berm continues west from the raised roadway, to the valley wall, and defines the upstream end of the 205 levee at present. The upstream third of this segment consists of portions of Frager Road which are set back from the channel edge, landward of a relatively wide strip of tilled agricultural property. The middle third of the levee here is defined by Frager Road, placed immediately adjacent to the channel along a steep embankment at an outer bend location. Both the middle and downstream thirds are covered with rip-rap armor and largely support invasive reed-canary grass and blackberries. Toe buttress structure is questionable throughout. The downstream third is set back from the channel more than the middle third, with slightly gentler slopes, and also supports a few native shrubs. The upstream third also supports some native shrubs, in addition to canary grass and blackberries, but the slope generally drops away rather steeply from the edge of the agricultural terrace, and does not appear to have rip-rap armor present. A localized area of immature native tree and shrub plantings is also present at the very upstream end here, installed as mitigation measures for the So. 200<sup>th</sup> Street Bridge. No other buffer area is present. Neither of the upstream two-thirds of this segment may provide adequate freeboard above the base flood elevation at present, and landward areas are about four to eight feet in elevation below the levee crest. Reconstruction of the middle (and possibly lower) third of this segment at slope angles needed to provide minimum recommended factors of safety for levee stability should be provided here as part of any future development of adjacent site areas, together with provision of adequate freeboard. (Green River, Unincorporated)</p>	N	<p><b>Frager Road Levee Setback:</b> Rehabilitate existing Frager Road Levees with setback relocation, restore habitat and increase flood storage and conveyance capacity. Stabilization of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the levee slopes at a minimum 2.5H:1V slope angle. This action could be targeted to future development at this site location, and should definitely be included in any such action. A levee toe buttress should be constructed with large woody debris structures and excavation of a mid-slope bench/buttress stabilized and re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be stabilized with native vegetation. (Green River, City of Tukwila)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.11	17.4	L	<p><b>O'Connell/Frager Road Lower:</b> Frager Road also forms the levee here, between So. 200<sup>th</sup> and So. 204<sup>th</sup> Streets. The upstream two-thirds of this segment are situated at the edge of a steep slope, with some rip-rap armor present in places. Toe buttress structure is questionable throughout. The downstream third is set back from the steep, sloughing edge of the embankment, with a brush-covered floodplain terrace in between. Most of the terrace and the slopes throughout this entire segment are dominated by reed canary grass and blackberries. Though some native shrubs are present in places. Mitigation plantings with native riparian trees and shrubs are present at the downstream end, near the So. 200<sup>th</sup> St. Bridge right of way. Frager Road may not currently provide adequate freeboard above the base flood elevation in this reach, and landward agricultural and wetlands areas are up to ten or twelve feet in elevation below the levee crest. These lands have recently been proposed for development. Johnson Creek discharges through a flap-gate near RM 17.33 in this reach. Flapgate operation has previously been hampered with lodged debris, and is generally considered to impede fish passage, especially for juvenile salmonids. Due to the inadequate freeboard in the associated Frager Road levee, the flapgate may not qualify as a flood closure structure for floodplain mapping purposes. Relocation of steep portions of this levee to provide adequate factors of safety, and freeboard improvements, should be part of any future development of adjacent land areas. (Green River, Unincorporated)</p>	N	<p><b>Frager Road Levee Setback and Johnson Creek Restoration at RM 17.4:</b> Rehabilitate existing Frager Road Levees with setback relocation, restore habitat and increase flood storage and conveyance capacity. Stabilization of this levee segment should be incorporated into a reach-length levee setback relocation with acquisition of sufficient easement area for reconstruction of the levee slopes at a minimum 2.5H:1V slope angle. This action could be targeted to future development at this site location, and should definitely be included in any such action. A levee toe buttress should be constructed with large woody debris structures and excavation of a mid-slope bench/buttress stabilized and re-vegetated with live willow layers and native riparian vegetation. The upper levee slopes should also be stabilized with native vegetation. The outlet of Johnson Creek should be reconfigured with a fish passable structure in connection with these efforts, while retaining flood closure capability for higher mainstem flows. This project element should be incorporated into any floodplain, habitat, or wetlands restoration, modification, or improvement actions on Johnson Creek which may be undertaken by others. (Green River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.12	17.97	R	<b>Boeing /Christian Brothers:</b> The levee throughout this entire segment has been set back about 150 feet from the edge of the channel. A paved trail is located on the levee crest, and native riparian trees and shrubs have been planted along the landward side of the levee, and throughout the setback levee face slope and two excavated mid-slope benches at the downstream end of this segment. A single clump of mature cottonwoods is present on the top of bank near RM 17.30. Several localized clumps of willows mark repairs at previous slump repair locations near the upstream end of this segment. Additional slumps are present on the highly unstable river slope throughout the remainder of this segment. Large rock toe buttress structures with embedded large woody debris are also present at these repair locations. While a significant opportunity for floodplain and instream habitat restoration and riparian buffer reestablishment was provided by the levee setback, no functional vegetative buffer is currently present. Most of the bank remains dominated by blackberries and reed canary grass. A single line of power poles will need to be relocated in order to accomplish further restoration. This levee provides two feet of freeboard above the base flood elevation. Protected areas landward of the levee are four to six feet below the base flood elevation. (Green River, City of Kent)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.4	17.65	L	<b>Omlid /Frager Road Lower:</b> Frager Road forms the levee here, and closely abuts a small cluster of farmhouses, barns, and other agricultural outbuildings. The upstream end of this segment sits at the outer bend of a relatively tight curve in the river. Slopes are very steep and generally covered with rip-rap armor. Toe buttress structure is questionable throughout. Localized slope erosion and shallow slumping are evident in places, and some cracking and settling of the asphalt along this portion of Frager Road indicate incremental settlement of slopes overall. Slopes are covered with reed canary grass and blackberries, with only an occasional native shrub present. No buffer is present. Frager Road may not provide adequate freeboard above the base flood elevation for floodplain mapping purposes. Protected areas are up to twelve feet in elevation below the levee crest. (Green River, City of Kent)	N	Feasibility and technical analysis required.
17.65	17.98	L	<b>Frager Road Lower:</b> Frager Road forms the levee here, but may lack adequate freeboard above the base flood elevation. A single cluster of farm structures is present at the upstream end, and other portions of the protected area may be up to 12 feet below the base flood elevation. The levee is set back varying distances from the channel edge, with a floodplain terrace present in places riverward of the levee. Slopes immediately adjacent to the channel are still very steep and sloughing in places. Rock armor does not appear to be present. Toe structure is only apparent just downstream of So. 212 <sup>th</sup> St. Bridge. Vegetation is dominated by reed canary grass and blackberries, with some occasional trees and native shrubs present in places. Native willows form a dense cover just downstream of So. 212 <sup>th</sup> , and were placed by Kent to stabilize slopes adjoining the bridge abutments. While there may generally be sufficient area for a modest buffer, especially along the floodplain terraces, overall buffer vegetation is really deficient. (Green River, City of Kent)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.97	19.40	R	<p><b>Russell Road Lowest / Russell Road Lower / Holiday Kennel:</b> This segment is severely confined almost throughout by the close proximity of Russell Road S to the top of bank. The sole exception is near RM 18.60, at Van Doren's Landing Park, where a paved trail runs along the levee crest in a setback alignment landward of a narrow floodplain bench that supports a single row of planted immature Douglas firs. At three locations localized slope repairs have excavated the road shoulder to create midslope benches. A small amount of large woody debris and native vegetation were installed at these repair sites. In addition, a surprising density of native willows and other native riparian shrubs has begun to establish near RM 18.25. Elsewhere throughout this reach the slopes are steep, the toe structure is questionable, the banks are heavily vegetated with blackberries and reed canary grass, and localized slumps and erosion are evident. A nearly continuous strip of properties landward of the road owned by The City of Kent has been identified in the United States Army Corps of Engineer's Ecosystem Recreation Program as a potential location for setback relocation of Russell Road, thereby providing for future floodplain, riparian and instream habitat restoration actions. (Green River, City of Kent)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
17.98	18.95	L	<b>Fragar Road Lower /216<sup>th</sup> St., 216<sup>th</sup> St. US:</b> Frager Road also forms the levee here, and generally sits right at the edge of a very steep embankment. Though rip-rap armor is generally evident, most of the slope shows signs of local erosion and slumping, with a pronounced slump right up to the road shoulder near RM 18.67. Reed canary grass and blackberries dominate, with localized native shrubs and immature trees here and there, and with a small grove of mature cottonwoods present on a narrow floodplain terrace managed as a small park just upstream of So. 216 <sup>th</sup> Street. Frager Road may not currently provide sufficient freeboard above the base flood elevation. Recent major residential developments in this area have provided Kent with a 200-foot Shorelines setback, which may be used for future levee relocation to a stable, landward position, together with floodplain restoration. No vegetated buffer area is provided at present. Upstream of So. 216 <sup>th</sup> St., Frager Road has been closed to vehicular traffic and is managed by Kent as a paved trail. (Green River, City of Kent)	N	Feasibility and technical analysis required.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
18.95	20.0	L	<p><b>Frager Road Lower /Stoneway Lower &amp; Upper:</b> Frager Road here follows several gentle bends in the river, with the roadway set at the edge of steeper slopes around the outer bends, and with more gentle slopes on the inner bends. The roadway embankment serves largely as a revetment structure, with little or no development present in lower-lying areas needing flood protection of any sort. River banks are covered with rip-rap in steeper portions, with evidence of surficial erosion and slumping in places. Toe buttress structure is questionable throughout. Blackberries and reed canary grass are the dominant cover, with some occasional immature native deciduous trees in places. Very little vegetated buffer is present along the banks. Landward areas are generally heavily forested, and include both steep hillsides and wetlands, in flatter floodplain areas. These latter include the mouth of Midway Creek near RM 19.67. A new bridge crossing and a roadway passing up the steep slopes are under construction at So. 228<sup>th</sup> St., and will include excavation of a low bench along the water's edge, together with installation of large woody debris habitat structures. Frager Road has been closed to traffic in this reach, and is managed by Kent as a bike trail. This may allow some set back of at least one lane width, possibly allowing for slopes to be reconstructed at stable angles, and adequately revegetated. (Green River, City of Kent)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
19.40	20.40	R	<p><b>Soames-Dolan / Russell Road Upper #1:</b> The levee here is co-located with a paved City of Kent Trail, which incorporates a portion of the former Russell Road alignment that is now closed to vehicular access within Kent's Russell Wood Park. The lowermost portion of this levee is set back behind a grove of mature cottonwoods, but a gravel road and parking lot still intrude right up to the river bank. The upstream portions of this segment are over steepened, the toe structure is questionable, and localized erosion and slumping are present. The downstream portions of this levee system are in close proximity to residential buildings in the Lakes subdivision, and the river bank is characterized by extensive sediment deposits forming a low bench that drops off steeply at the edge of the channel. Overall, this lower portion of the levee system has not shown evidence of slumping or erosion, but sinkholes have developed along the crest of the levee prism. Recent repairs of these sinkholes have revealed that the levee is largely composed of unaltered native alluvium with poor structural characteristics. The vegetation throughout this segment is dominated by reed canary grass with blackberries and some scattered clumps of native trees and shrubs. A narrow strip of land owned by the Kent Parks Department extends along the full length of these facilities along the landward side. This has been identified in the United States Army Corps of Engineer's Ecosystem Recreation Program as a potential site for levee setback, floodplain, riparian and instream habitat restoration. The levee system appears to appear two feet of freeboard throughout. Protected areas are about four to six feet in elevation below the levee crest. (Green River, City of Kent)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
20.0	20.85	L	<b>Roscoe Nursery/ Cottonwood Grove Park:</b> Slopes here are locally over-steepened, with rubble deposits present in at least one location. Localized erosion and slumping are also evident. While blackberries and canary grass are present throughout, a relatively narrow buffer of some native deciduous trees and shrubs is also present in places. A grove of mature cottonwoods at the downstream end of this segment is operated as a small park by Kent. Though no County facilities are present, the site has previously been recommended as a habitat restoration project location. (Green River, City of Kent)	N	<b>Roscoe Nursery Off-Channel Rehabilitation and Riparian Restoration at RM 20.0 to 20.9:</b> Acquire degraded floodplain properties. Relocate revetment system landward and improve flood storage and conveyance. Restore river edge habitat with large woody debris placement, stabilize the bank with construction of a midslope bench/buttruss, restore floodplain and wetland habitat, and stabilize the site with native riparian vegetation. (Green River, City of Kent)
20.40	20.45	R	<b>Russell Road Upper #2:</b> The levee and paved trail here closely border on the road shoulder of Russell Road at its intersection with West James Street. The bank is significantly over steepened and has been partially repaired in the recent past. Some native plantings and large woody debris pieces were installed along with partial reconstruction of a rock toe buttress structure. The levee crest appears to provide two feet of freeboard above the base flood elevation. Protected areas are from six to eight feet in elevation below the levee crest. The levee remains over steepened and repairs to date are likely to have been inadequate due to the overall slope steepness. The City of Kent owns a small tract of land just east of Russell Road that could allow for the setback relocation of the road and levee. (Green River, City of Kent)	Y	<b>Russell Upper Levee Project:</b> Repairs of this flood protection facility should be incorporated into a reach-length levee setback with the acquisition of sufficient easement areas for full reconstruction of the riverward levee slopes at minimum 2.5H:1V slope angles. Setback levee reconstruction in this location will require modification or relocation of the existing Russell Road/James Street intersection as well. Levee slope stabilization would include reconstruction of the levee toe buttress, installation of large woody debris structures, excavation of a mid-slope bench/buttruss revegetated with live willow layers and native riparian trees and shrubs, and stabilization of the upper bank. (Green River, City of Kent)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
20.45	21.92	R	<p><b>Kent Shops / Narita / Myers Golf:</b> The levee here adjoins the City of Kent's Riverbend Golf Course. The riverward levee slopes are extremely over steepened in several locations, with erosion, slumping and settlement along the levee crest clearly visible. Two locations just downstream from the Meeker Street bridge near RM 21.20 have previously been repaired. Immediately downstream from the bridge synthetic geogrid wraps with live willow layers were installed by the City of Kent over a riprap toe buttress. A short distance downstream the levee crest was set back at an overall slope angle of up to 3H:1V. This provided space for construction of a mid-slope bench, a rock toe buttress, a plentiful array of large woody debris and extensive native riparian tree and shrub plantings. Elsewhere throughout this segment the slope is covered with rock riprap armor, the toe structure is highly questionable, and slope stability may be further compromised by the potential for saturation from seepage associated with artificial ponds maintained within the golf course. Vegetation on the river bank is mostly blackberries and reed canary grass. A narrow band of individual trees and occasional small groves of cottonwoods and maples is present along the landward margin of the levee system. Otherwise, the entire vegetated buffer area is occupied with tees, greens, fairways and golf cart trail. A small apartment and golf driving range are located near the upstream edge of the Myers Golf levee. (Green River, City of Kent)</p>	Y	<p><b>Kent Shops Levee Project:</b> Repair of this levee segment should be incorporated into a reach-length levee setback with acquisition of sufficient easement area for reconstruction of the riverward levee slopes at minimum 2.5H:1V slope angle. This project would include reconstruction of the levee toe, installation of large woody debris structures, excavation of a mid-slope bench and toe buttress revegetated with live willow layers and native riparian trees and shrubs, and stabilization of the upper bank. (Green River, City of Kent)</p> <p><b>Narita Levee Project:</b> This levee segment should be incorporated into a reach-length levee setback with acquisition of sufficient easement area for re-construction of the riverward levee slopes at a minimum 2.5H:1V slope angle. This segment is immediately downstream from previous setback levee reconstruction projects at the Narita Levee in 2001 and 2004. This project would include reconstruction of the levee toe, installation of large woody debris structures, excavation of a mid-slope bench and toe buttress re-vegetated with live willow layers and native riparian trees and shrubs, and stabilization of the upper bank. (Green River, City of Kent)</p> <p><b>Myer's Golf Levee Project:</b> This levee segment should be incorporated into a reach-length levee setback reconstruction project with acquisition of sufficient easement area for reconstruction of the riverward levee slopes at a minimum 2.5H:1V slope angle. This project should include reconstruction of the levee toe, installation of large woody debris structures, excavation of a mid-slope bench and toe buttress revegetated with live willow layers and native riparian trees and shrubs and stabilization of the upper bank. (Green River, City of Kent)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
20.85	21.3	L	<b>Fragar Road Lower /Maddox /Kent Golf Left:</b> Frager Road forms the levee here, and is located at varying distances from the steep riverbank. In two outer bend locations, near the upstream and downstream ends of this segment, the road sits right at the edge of the very steep, rip-rap armored bank, dominated with canary grass and blackberries. Toe structure is questionable throughout. Slumping is present near the downstream end, including visible cracking and settlement of portions of the paved roadway. Protected areas include the Kent Golf course and one or two residential properties. Frager Road may not provide sufficient freeboard above the base flood elevation. The middle portions of this segment are set back from a modest floodplain terrace with some mature native deciduous tree cover present. Other areas have no buffer at all. Frager Road is closed to all but local traffic in this reach, and largely functions as a paved trail. (Green River, City of Kent)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
21.3	22.13	L	<b>Frager Road Middle /Leber Bros. /PD&amp;J Packing #1:</b> Frager Road forms the levee here, and is located at varying distances from the steep riverbank. The City of Kent's Fishing Hole Park is located at the downstream end of this segment, where a minor tributary also enters the river through a hung culvert. Steep slopes are covered with rip-rap armor within downstream portions, downstream of the Mullen Slough confluence near RM 21.59. The roadway is set back a modest distance from the channel adjacent to the old PD & J Packing site at the upstream end, which is owned by Kent as a future park site. A nursery supply business is located in the center of the reach. Other properties along Frager Road have recently been purchased as natural Resource lands by King County. The existing channel edge is steep and locally unstable, with a number of shallow slumps present. Some native shrub cover is also evident in places, but there is little overall in the way of a functional buffer, and the structural integrity of the slopes is highly questionable. The recent purchases may allow set back of the roadway and the creation of a functional vegetative buffer and channel edge in this segment. (Green River, Unincorporated, City of Kent)	N	<b>Lower Mill Creek, Green River Park, Hawley Road Levee, Frager Road Levee, and Lower Mullen Slough:</b> Rehabilitate steep, eroding levees and revetments with set backs along Frager Road. Restore channel edge habitat with reconstruction of the levee toe buttress, incorporating large woody debris. Flatten steep banks with road set back and excavation of a midslope bench/buttress, and improve flood storage and conveyance capacity. Improve tributary access at the mouth of Mullen Slough and the small tributary at Fishing Hole Park. Restore degraded riparian and floodplain habitat conditions with floodplain reconnection grading and plantings of native riparian, floodplain, and wetland species. (Green River, Unincorporated, City of Kent)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
21.92	22.13	R	<p><b>Pipeline / Okimoto:</b> Both levees in this segment have been previously repaired. The Pipeline Levee at the downstream end has been set back into the margins of a large retention/detention pond adjacent to an apartment complex. The slopes were regarded to form two midslope benches and the bankline was scalloped to install large woody debris into the bank along the channel edge. Native riparian vegetation planted during this project is slowly establishing. Some soil amendments and alleviation of soil compaction may be needed to promote more robust vegetation growth.</p> <p>Extensive vandalism occurred following revegetation of this site with removal of almost 100 % of the plantings on the landward slope of the flood protection facility, which has subsequently been invaded by Scots broom. The river bank is steeper on the Okimoto Levee, which adjoins another apartment complex. While large woody debris was not installed with the Okimoto repair, live geogrid plantings have grown profusely to form dense cover overhanging the channel. A paved trail is located along the levee crest. The levee appears to provide two feet of freeboard above the base flood elevation. Landward areas are about two to 12 feet in elevation below the levee crest. (Green River, City of Kent)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
22.13	23.28	L	<p><b>Frager Road Upper /PD&amp;J Packing #2:</b> Frager Road serves as the levee here, and protects several farmhouses and associated barns and outbuildings. Nearly the entire “protected area” is composed of agricultural fields, which flood during high flows anyway, with Green River flows passing overland through a broad floodway between the mouths of Mill Creek and Mullen Slough. Minor portions of the reach include narrow floodplain benches between the road and channel edge, but with little in the way of a functional buffer. A small grove of mature cottonwoods and a narrow band of immature planted Douglas fir trees are present along the top of bank in the middle portions of this segment. Rip-rap armor is generally present on the bank, in the downstream half of the reach, but is generally absent in upstream areas. Most of the bank is dominated with reed canary grass and blackberries, but the upstream portions of the reach support large clumps of red-twig dogwood. Toe structure is questionable throughout. Significant recent slumping is highly visible just downstream of Washington Avenue Bridge (West Valley Road). Previous slumping of over 400 feet of the bank has been observed near RM 22.7. Slopes are not at stable angles of repose, and continued deterioration can be anticipated unless setback reconstruction addresses this problem. This would require added right of way or easements, and would involve some Farmland Preservation Program lands as well. (Green River, Unincorporated)</p>	N	<p><b>Lower Mill Creek, Green River Park, Hawley Road Levee, Frager Road Levee, and Lower Mullen Slough:</b> Rehabilitate steep, eroding levees and revetments with set backs along Frager Road. Restore channel edge habitat with reconstruction of the levee toe buttress, incorporating large woody debris. Flatten steep banks with road set back and excavation of a midslope bench/buttress, and improve flood storage and conveyance capacity. Restore degraded riparian and floodplain habitat conditions with floodplain reconnection grading and plantings of native riparian, floodplain, and wetland species. (Green River, Unincorporated)</p>



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
22.13	23.28	R	<b>Signature Pointe Lower / Signature Point Upper / County Road #8:</b> A sharp inner meander bend is wholly occupied by the Signature Pointe Apartments. A paved trail extends along the full length of the top of bank. The apex of the bend is characterized by relatively gentle slopes and dense, mature native trees and shrubs. Elsewhere throughout this segment, the slopes are steep, armored with riprap, covered with blackberries and reed canary grass and scattered clumps of native willows. The toe structure is questionable throughout these steeper areas. Large slumps that occurred at both Signature Pointe Upper and Lower were repaired with slope regrading, rock toe buttress construction, large woody debris installation and native willow layers forming live geogrids on the lower slopes. Extensive vandalism occurred following revegetation of this site with removal of almost 100 % of the plantings on the riverward slope of the flood protection facility, which has subsequently been invaded by Scots broom. (Green River, City of Kent)	N	Feasibility and technical analysis required.
23.28	23.94	L	<b>Koch /Corps Revetment /Bradley /Mill Creek:</b> Older rip-rap and concrete rubble revetments line the bank through the middle portions of this reach. The downstream end is occupied by a small farm on an inner bend, with tilled fields up to the top of the steep, unarmored bank, which supports some willows.. The very central portions of this segment are formed by the road shoulder embankment for the West Valley Highway. A thin band of remarkably mature native deciduous trees lines the riverbank here. Steep, rip-rap covered banks continue upstream , adjacent to several small farmhouses, to the mouth of Mill Creek near RM 23.82. Toe structure is questionable throughout. A fairly large, dense grove of native riparian deciduous trees extends upstream from Mill Creek along the riverbank, to the SR 167 right of way. Aside from this, there is little functional buffer present in this reach. (Green River, City of Kent)	N	<b>Lower Mill Creek, Green River Park, Hawley Road Levee, Frager Road Levee, and Lower Mullen Slough:</b> Acquire adequate ROW and easement areas for setback road and levee reconstruction. Set back and rehabilitate steep, eroding levees and revetments along the riverbank and West Valley Highway. Restore channel edge habitat with reconstruction of the levee toe buttress, incorporating large woody debris. Flatten steep banks with road and levee setbacks and excavation of a midslope bench/buttress, and improve flood storage and conveyance capacity. Improve tributary access and channel habitat complexity with incorporation of large woody debris at the mouth of Mill Creek. Restore degraded riparian and floodplain habitat conditions with floodplain reconnection and regarding, and with plantings of native riparian, floodplain, and wetland species. (Green River, City of Kent)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
23.28	23.94	R	<b>Hawley / Riverview Park:</b> Hawley Road is located along the top of bank along the downstream half of this segment. The slopes are armored with riprap, the toe structure is questionable, erosion and slumping is visible and vegetation is dominated by blackberries and canary grass with occasional willows present. The upstream half of this segment is a City of Kent Park is scheduled for construction of a side channel as part of the U.S. Army Corps of Engineer's Ecosystem Recreation Program. (Green River, City of Kent)	N	Feasibility and technical analysis required.
23.94	24.2	L	<b>Kent Airport:</b> This flood protection facility adjoins commercial buildings and a freight loading area. A small stormwater pumping station is located at the downstream end, with the outfall passing through the levee. A detention pond is present behind the levee prism in the central portions of this segment. Some rip-rap armor is present, but may be discontinuous. Toe structure is questionable throughout. A significant slump has previously been observed in the upper third of the site. Blackberries and reed canary grass dominate the slope cover, with some willows and other native shrubs species present here and there. Tree cover is locally present landward of the levee, and near the pump station at the downstream end. Slopes remain steep and unstable, and no functional buffer is present. (Green River, City of Kent)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
23.94	24.39	R	<b>Milwaukee #1 / Milwaukee #2:</b> This reach is bisected by the old Milwaukee Road RR bridge. Downstream from the bridge, the Milwaukee #1 Levee sits at the top of bank adjacent to a regional retention/detention pond managed as Kent's Foster Park. The levee is steep, armored with riprap, the toe structure is questionable, localized bank erosion is visible, and the vegetation is dominated by reed canary grass and blackberries, with some willows present downstream from the RR bridge. Upstream from the RR bridge, the Milwaukee #2 Revetment borders the edge of S 259 <sup>th</sup> St and a small commercial structure. The bank here is very steep, armored with riprap, the toe structure is questionable, localized bank erosion is visible, and the vegetation is dominated by reed canary grass and blackberries, with some willows present. A proposed extension of the Green River trail is planned here, but will require additional right-of-way and set backs up to S 259 <sup>th</sup> St. The entire buffer area is occupied by the roadway and adjacent commercial properties. (Green River, City of Kent)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
24.2	25.0	L	<p><b>Wrecking Yards /78th Ave. S:</b> Several existing and former wrecking yard sites adjoin either the steep riverbank or 78<sup>th</sup> Avenue So., along the steep, unstable riverbank, throughout the downstream 2/3 of this segment. A roofing company occupies a small inner bend just upstream of the 78<sup>th</sup> Ave. So. Bridge (Alvord T Bridge) near the center of the reach. Undeveloped lands border the most upstream portions of 78<sup>th</sup> Ave. The riverbank is steep and lacking any structural reinforcement downstream of the bridge. A narrow band of shrubs and blackberries is present here, with localized erosion and slumping present. A modest amount of native vegetation is present along the bank just upstream of the bridge, with some mature cottonwoods and maples present. Where 78<sup>th</sup> Ave. fronts the river, slopes are steep and covered with rip-rap. Toe structure is questionable throughout. Localized erosion and slumps are visible. Slumping near the upstream end of the roadway has previously been observed, and was repaired with end-dumped rip-rap, in 1991. Locally, a thin band of immature alders is present along the road embankment, growing through the rip-rap. No functioning vegetative buffer is present. 78<sup>th</sup> Ave S may not provide adequate freeboard above the base flood elevation. (Green River, Unincorporated)</p>	N	<p><b>78<sup>th</sup> Avenue South at RM 24.3 to 25.0:</b> Acquire degraded floodplain properties. Relocate the roadway/revetment system landward and improve flood storage and conveyance capacity. Restore the river edge habitat with installations of large woody debris. Stabilize the riverbank by flattening steep slopes and excavating a midslope bench/buttrass. Regrade and restore floodplain habitat areas, and plant the riverbank, midslope bench, and reconnected floodplain areas with native riparian, floodplain, and wetland vegetation. (Green River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
24.39	26.20	R	<b>Horseshoe Bend 205 / McCoy / Breda / Plemmons / Nursing Home / Nursing Home Extension:</b> This entire segment is a federally authorized levee system. A narrow bench with dense willows connects to a split flow channel with a vegetated mid-channel bar adjoining an earlier repair near RM 25.37. Other repairs are located just downstream from another narrow bench near RM 25.70, along a steeper portion of the flood protection facility near RM 25.25 and extending from RM 24.50 to RM 24.90. All these repair locations include rock toe buttress structures, large woody debris, and densely established willows. A 1700 foot long portion of the Breda Levee was recently set back up to 30 feet from the former top of bank. Additional slope flattening along this flood protection facility is planned to occur in 2006. Portions of this levee system at the extreme upstream and downstream ends remain extremely over steepened and settlement of the paved trail near RM 26.50 has recently been observed. Other damage to the river bank near RM 25.90 was associated with a recent commercial development and will require permanent repairs to retrofit interim emergency bank armor repairs. (Green River, City of Kent)	Y	<b>Nursing Home Levee Project:</b> Repair of this levee segment should be incorporated into a reach-length levee setback with acquisition of sufficient easement area for reconstruction of the levee at a minimum 2.5H:1V riverward slope angle. Repairs should include reconstruction of the levee toe, installation of instream large woody debris structures, excavation of a mid-slope bench and toe buttress and re-vegetation of the lower bank and bench with live willow layers and native trees and shrubs. Levee upper slopes should also be stabilized. (Green River, City of Kent)
25.0	25.3	L	<b>No Name:</b> Small farmhouses adjoin the steep riverbank, with some local evidence of earlier private action to stabilize the slopes visible below the Railroad bridge in the center of this reach. Mature tree cover is present in the downstream half here, mostly right along the riverbank itself, including several non-native chestnut trees. Despite this, vegetation is limited to a narrow band along the bank. The upstream half of the site also has trees confined to the riverbank, though the site is owned by King County Agricultural Program, and is leased to small farmers for specialized crop and horticultural production. No bank armor is visible. Some slumping is present. Green River floodwaters apparently do not overtop the bank, but local flooding due to Northeast Auburn Tributary may affect these county lands, under East Valley Highway at the upstream end. (Green River, Unincorporated King County)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
25.3	27.66	L	<p><b>Monk Farm /Horsehead Bend /Jeff Estates:</b> Revetments are present at the Monk Farm and Jeff Estates facilities, located at the downstream end and central portions of this reach, respectively. The Monk Revetment is steep, armored with rip-rap, and covered with blackberries. Toe structure is questionable. No vegetative buffer is present. The flood protection facility adjoins a small farmhouse and cluster of outbuildings at the end of 84<sup>th</sup> Ave. So. A new County trail bridge is proposed to cross the Green River at this location. The Jeff Estates flood protection facility is a biostabilization demonstration site dating from 1984. Though smaller rip-rap was used to construct the revetment toe, it appears stable, perhaps due to its relatively gentle slope angle, at about 3H:1V. Vegetated slopes at this same angle are remarkably stable, in a former active meander area, and support a dense growth of maturing native deciduous brush and tree species. Overall, this is a highly successful project. Elsewhere in the reach, slopes are extremely unstable and prone to channel migration and related erosion and slumping failures. Entire clumps of trees have caved into the river near RM 25.8, and with them, a former access roadway along the previous top of bank. Near the Carpinito Farm buildings near the upstream end of this reach, at RM 27.5, the channel has moved over 150 feet to the west, in a rapidly advancing and active outer meander bend. Proposed location of a future trail along the bank in this reach will be problematic until the channel migration phenomena are adequately addressed. Most of the lands in this reach are mapped within the floodplain of NE Auburn Tributary, which drains to the river through a large culvert with a flapgate. Though the land surface here does not appear to overtop at high Green river flows, no freeboard is present above the base flood elevation. Therefore the flapgate is not considered eligible for consideration as a closure device for floodplain mapping purposes. As juvenile salmonids have previously been found in this tributary, the flapgate may also impede fish passage. (Green River, Unincorporated)</p>	N	<p><b>Horsehead Bend and Northeast Auburn Creek:</b> Relocate deteriorating levee and access roadway to edge of agricultural terrace to Protect King County trail corridor from bank erosion and channel migration, and to conserve productive agricultural soils. Evaluate a range of flood risk reduction strategies to protect productive Farmland Preservation Program agricultural soils. Replace non-compliant flood closure flapgate with fish-passable structure at the mouth of Northeast Auburn Creek and restore stream habitat with large woody debris and native tree and shrub plantings. Regrade and reconnect additional floodplain areas and re-create side-channel habitat. Stabilize channel migration areas along the margin of the trail corridor with instream large woody debris and ELJ complexes, restore habitat complexity along the toe of the riverbank and along the aquatic edge of the channel with additional large woody debris placement. Regrade steep, failing riverbanks to stable angles of repose and excavate midslope benches/buttresses, and restore and stabilize mid-slope benches, riverbanks, and reconnected floodplain, side channel and wetland habitat areas with native riparian tree and shrub plantings. (Green River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
26.20	30.35	R	<b>Titus Boat Ramp / Titus Pit / Green River Road / Neilson / Mallory / Malnati / Auburn Golf &amp; Olson / Isaac Evans Park / Valentine's Road Protection / 104<sup>th</sup> Road Protection / 30.5 Road Protection:</b> This long segment includes several locations where Green Valley Road and S 104 <sup>th</sup> St lie immediately at the top of bank. While in places small meander bends are present riverward of the road and are managed as part of the North Green River Park and Isaac Evans Park in Auburn, the road shoulder along the river is uniformly steep, unstable, eroding, slumping, covered with riprap and vegetated with blackberries and reed canary grass. The toe structure is highly questionable throughout these road locations. While a narrow band of immature trees can be seen in places, most of these road shoulder locations are covered with blackberries and reed canary grass. At several small bends which form Green River Park, mature cottonwood forests and floodplain stands of willows are present. (Green River, Unincorporated, Cities of Kent, Auburn)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
27.66	28.68	L	<b>Auburn Trail Corridor:</b> No flood management facilities are currently present in this reach. A previous channel migration and meander location near RM 27.9 has recently re-activated. Downstream portions of this segment lack all but a narrow fringe of vegetation, though lands here are proposed for inclusion in a future trail corridor. Southerly portions of the reach have a wider if somewhat variable area of mature native deciduous cover present along the riverbank. The bank here is generally well vegetated, with some natural large woody debris present along the channel edge. Local instabilities are visible. Downstream areas are highly unstable, with little vegetation. Public ownership along the riverbank is anticipated in connection with trail development. Several recent development proposals are soon to begin implementing portions of this trail construction. Stability concerns will need to be addressed, largely through set backs, but also through deliberate planning for bank stabilization measures. Though high flows in the Green River do not appear to overtop the bank in this reach, no freeboard is present either, above the base flood elevation. (Green River, City of Auburn)	N	Feasibility and technical analysis required.



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
28.68	29.54	L	<b>Reddington /Brannon Park:</b> The Reddington Levee here follows an old road alignment and cuts off older meander scrolls, one of which has been developed as a trailer park within the mapped floodplain of the Green River. These older meanders are connected to the river with a poorly constructed culvert through the levee, fitted with a small flapgate. Flooding of the trailer park still occurs, when this system fails to properly close during flood events. Just upstream of these meanders, a newer culvert outfall with a flapgate and backup closure system have recently been constructed to serve new developments and a future regional stormwater system planned by Auburn. The lower end of the Reddington Levee is constructed at steep slope angles with rip-rap armor, and supports very little vegetation other than blackberries and canary grass. Central portions of this segment are set well back from the riverbank, and pass through a mature deciduous riparian grove of cottonwoods and other trees and shrubs. The Brannon Park portions of this reach include very steep rip-rap armored portions that encroach closely on the channel, together with a minor, vegetated meander bar near the upstream end. The levee borders an Auburn park with ball fields, a sewage pump lift station, and a regional biofiltration swale with a concrete-imbedded rip-rap outfall through the levee. Toe structure is questionable in all rip-rap slope portions along the channel edge. Two feet of freeboard is likely present throughout, with landward areas, especially at Brannon Park, located about six to eight feet in elevation below the levee crest. (Green River, City of Auburn)	N	<b>Reddington Levee Setback and Riverside Estates Side Channel Reconnection:</b> Remove and reconstruct the Reddington Levee in a setback location adjacent to the mobile home park, along the landward edge of the old side-channel area. Reconnect the old side-channel habitat to the mainstem. Reduce the flooding of mobile homes due to the existing malfunctioning flapgate/culvert system, and install a new, robust flood closure system with a backup closure device. Stabilize the channel edge and restore aquatic habitat complexity with large woody debris installations, and revegetate both the new levee slopes and the former levee footprint area with native riparian trees and shrubs. (Green River, City of Auburn)
29.54	31.09	L	<b>Galli's Section /Dykstra /Lone's 3<sup>rd</sup> Addition /DS Porter Bridge Left:</b> This reach contains a series of discontinuous levees, revetments, and otherwise modified riverbanks. Leveed portions, as at the Dykstra Levee near RM 30.7, generally provide two feet of freeboard over the base flood elevation, but in other locations, as behind the apartments near RM 29.9, there is no flood containment structure at all. Even though floodwaters do not appear to overtop in this	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
			<p>reach, adequate freeboard is not provided throughout. Where raised levees are present, the adjoining protected areas are located about three to 8 feet below the levee crest. Nearly the entire reach adjoins residential properties, with a mix of single and multifamily homes present. Where rip-rap armor is present, as between RM 29.54 and 29.75, and again between RM 30.1 and 30.85, it is frequently over steepened, with localized erosion, and toe structure is questionable throughout. The exceptions here are limited to several local areas where the levee was reconstructed with large toe buttress rock, large woody debris deflectors, and with willow and dogwood cuttings installed in live geogrids. This has been accomplished in the upstream third of the Dykstra Levee, and within the native Growth Protection Easement area at Lone's 3<sup>rd</sup> Addition. In most cases, homeowners have cut, sprayed, or removed many of the native planting sites, significantly impairing slope stability. No structural slope protection measures appear to be present upstream from RM 30.85, or between RM 29.8 and 30.0, where native willow growth on the vegetated bar along the channel edge is routinely cut to the ground by the adjacent apartment owners. An occasional thin fringe of vegetation is present here and there along this reach, largely confined to the riverbank itself. Blackberries and reed canary grass alternate with a few immature deciduous trees here and there. Overall, there is no functional vegetated buffer area. There are two active, vegetated mid-channel bars near RM 30.2, which recruit natural large woody debris deposits, and which may influence flow direction and velocities affecting the Dykstra Levee, where toe erosion is already visible. (Green River, City of Auburn)</p>		

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
30.09	33.74	R	<b>North Green Valley Wall:</b> Just upstream from 8 <sup>th</sup> St NE, several single-family homes are located along the top of bank. Tree cover, while disturbed, is still visible along the back yards of these properties next to the river. From RM 31.30 upstream to SR-18 at RM 33.74, the river forms two sharp meander bends along the base of the valley wall. Intact mature forest cover is present throughout. Side channels are present near the upstream end of this segment, and a meander chute cutoff avulsion channel at RM 33.00 contains a large, dynamic and complex natural logjam. All lands upstream from the residential properties are in public ownership within this segment. (Green River, Unincorporated, City of Auburn)	N	Feasibility and technical analysis required.
31.09	31.8	L	<b>Matson /Barnett /Porter Gauge /Auburn Residential:</b> A series of idiosyncratic, individual attempts at bank protection are present in this reach, especially just upstream from the Porter Bridge (8 <sup>th</sup> St. NE Bridge, Lea Hill Bridge). These use varying elements such as rip rap, concrete blocks, and concrete rubble, usually placed at near-vertical slope angles. Slope failure here is somewhat postponed by the interesting mixture of native and exotic tree species, many of which are growing right out of the side of these steep structures, with the roots no doubt securing the bank for now. The Green River's Auburn Gauge is also in this reach, and is secured by a County-maintained revetment (Porter Gauge). Homes are built fairly close to the channel, with a few homes near the upper end set back from lower ground. Overall vegetation is spotty and mixed, with mown lawns, blackberries, and native and non-native trees and shrubs along the length of the yards here. Though floodwaters do not appear to overtop the yards in this segment, no raised freeboard structure is provided. No functional vegetated buffer is present. Any toe structures present are highly questionable. (Green River, City of Auburn)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
31.8	32.75	L	<p><b>Fenster /Pautzke /BNSF Railway:</b> Levees in this reach are largely training levees, and do not provide two feet of freeboard. Floodwaters do not appear to overtop the levee areas, however. The Fenster and Pautzke Levees both line the downstream edges of well-developed meander bends. Both are constructed at very steep slope angles with rip-rap armor, with local erosion and slumping visible. Toe structure is questionable throughout, and the levees are overgrown with a combination of blackberries and a scattering of immature native riparian trees and shrubs. A large stand of cottonwoods, alders, willows, and maples is present on the downstream portions of the Pautzke meander, and smaller groves are present behind the lower half of the Fenster Levee. A small, isolated swale is present behind the Fenster Levee, crossing a former pasture that is now owned by Auburn for development as an open space park. A larger swale near RM 32.02 was recently re-connected to the river in connection with repairs to a small portion of the Levee. Much of the Pautzke site is overgrown with blackberries, and half of the Fenster site is a former pasture, so that a functional vegetated buffer is not present throughout the reach. The very upstream end of the Pautzke Levee merges with the railroad embankment of the BNSF Railway, which, though steep, is constructed with large rock and vegetated with moderately mature native deciduous trees. This upstream portion of the site has been left as a side-channel, with the mainstem river abandoning this alignment during a meander chute cutoff channel avulsion in 1995 and 1996. Active sediment bars and vegetated bars occupy the former channel cross section, which still carries flows during larger events. (Green River, Unincorporated, City of Auburn)</p>	N	<p><b>Pautzke and Fenster Levee Setback &amp; Floodplain Reconnection:</b> Relocate the deteriorating levees to set back locations and re-establish old side-channel connections. Stabilize the riverbank against channel migration by reinforcing the aquatic edge of the channel with large woody debris installations. Regrade the steep levee slopes to flatter angles and construct midslope benches/buttresses. Regrade and re-connect the floodplain with the mainstem river, and reconnect isolated floodplain wetlands. Restore the regraded riverbanks, wetlands, and reconnected floodplain areas with native riparian tree and shrub plantings. (Green River, Unincorporated, City of Auburn)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
32.75	33.75	L	<b>Auburn Narrows /Mueller:</b> The main river channel downstream of RM 33.0 now cuts directly across the neck of a sharp former meander bend, forming a meander chute cutoff channel. The former mainstem channel downstream to RM 32.75 is now a series of active gravel bars, and carries flows only during higher discharge events. Upstream from here the river along the left bank has established an additional series of additional braided gravel bars and side channels, with dense native riparian deciduous tree cover up to RM 33.5. Formerly, a raised levee structure extended from the SR 18 bridge abutment at RM 33.75, downstream to RM 33.3. Most of the levee structure was removed in the mid 1990's, with several hundred feet of older rip-rap toe structure still present along the channel edge in the downstream portions of this reach still slated for eventual removal. A large floodplains wetlands complex has recently been constructed in the upstream portions of the Auburn narrows site by the City of Tacoma, as mitigation for their construction of a new water supply pipeline. King County is also completing work on a constructed side channel in this reach. It is likely that previous impacts to vegetative buffer areas by the earlier farming activity will be restored by the extensive plantings to be provided in connection with these two projects at this site, which is now wholly owned by King County. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
33.74	33.93	R	<b>33.8 / Four Bridges / Soos Creek / Lake Holm Road:</b> Soos Creek enters the Green River at RM 33.80. The mouth of Soos Creek is bordered by four separate bridges, but is being restored as a floodplain wetland managed by King County as open space. Small revetments are present near SR-18 and adjacent to a single-family home along Lake Holm Rd. (Green River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
33.75	33.92	L	<b>SR 18 / BNSF Railway Bridge /Soos Creek Downstream / Auburn Black Diamond Road Bridge /Soos Creek Upstream Washington Department of Fish and Wildlife Boat Launch:</b> The left bank here is carved up with a series of bridge abutments. Some rip-rap is evident, but mostly overgrown with brush and blackberries. A dirt parking lot and “boat launch” area is present at the upstream end. Some tree cover is present between the bridges and road embankments, but the area is pretty well chopped up with permanent structures. Concrete piers from the railroad bridge are located within the channel, and occasionally recruit large woody debris and smaller wood. A few pieces of large woody debris cabled to boulders have been sunk into the deeper pool present below SR 18. This is not your finest river reach, but heavily fished. (Green River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
33.92	35.12	L	<p><b>Porter /Neely:</b> The downstream ¼ of this segment is densely wooded with mature native riparian deciduous trees and shrub cover, extending from the nearby SE Green Valley Road across a narrow floodplain to the channel edge. The rest of the lower half of this segment is occupied by the remnants of the old Porter Levee, which has breached and washed out in places on several occasions. An intentional breach near the upstream end was also constructed by the Corps, to reconnect a previously isolated side-channel wetland complex. The Porter property here is now entirely owned by King County and managed as open space. Some replanting of the floodplain has also occurred. The entire site is subject to flooding on a nearly annual basis, with higher flow events extending to the SE Green Valley Road and seeping up through the gravel shoulder to flow across the asphalt near the Green Valley Meats Company.</p> <p>Upstream from the Porter property the Neely Levee extends along farm properties, downstream from the Neely Bridge, but does not tie into the Porter levee. The intervening bankline supports a dense grove of native deciduous tree cover on a sharp inner bend, with more immature trees and willows, interspersed with blackberries, forming a narrow band along the remains of the Neely Levee upstream. The river in this reach shows active channel migration, with the Neely levee acting as a training levee here. Nearly the entire “protected area” floods anyway, on a nearly annual basis. Toe buttress structure is questionable, overtopping and failure of the Porter Levee is a repeated phenomenon, and the Neely Levee does not provide flood containment, nor is it provided with a functional vegetative buffer. (Green River, Unincorporated)</p>	N	<p><b>Neely and Porter Levee Setback &amp; Floodplain Reconnection at RM 34.3 to 35.1:</b> Relocate deteriorating levees to the edge of the floodway within the adjoining agricultural areas at the Neely site, and to the Green Valley Road at the Porter site. Restore old side-channel connections and re-activate the former channel migration areas. Restore and stabilize the aquatic edge of the channel with large woody debris installations, reconnect and restore isolated floodplain wetlands, and plant all disturbed areas with native riparian and wetlands vegetation, as appropriate. (Green River, Unincorporated)</p>

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
33.93	35.05	R	<b>Green Valley Wall:</b> The channel edge here is a densely forested riparian corridor bordering the steep slopes of the east Green River valley wall. An active landslide is located at RM 34.66. Both active and vegetated gravel bars and side channels are present within King County open space at the mouth of a small unnamed valley floor tributary that enters the river at the very upstream end of this segment. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
35.05	38.22	R	<b>Horath / Kaech / Hamakami / Ross / Turley / Loans:</b> The Green River is bordered by several older levees and revetments which truncate a set of formerly active meanders along the margins of several agricultural properties that occupy the adjacent floodplain terrace. Some dense native vegetation is locally present on both sides of several of these older facilities, which provide minimal if any flood containment. In other locations the bank is actively and rapidly eroding as at the Ross Farm near RM 36.70 and at the Hamakami Farm near RM 36.10. Bank stabilization of the active meander at the Hamakami flood protection facility was accomplished with installation of large woody debris and native riparian plantings. This location has subsequently developed extremely complex and natural large woody debris accumulations with multiple, highly dynamic side channels, active vegetated gravel bars, and extremely complex instream habitat. Crude attempts at riprap stabilization of erosion of the Ross property have met with minimal if any success. Several proposals to relocate these facilities landward of their existing locations to the margins of the adjacent agricultural terraces have been included in the U.S. Army Corps of Engineer's Ecosystem Recreation Program and other planning efforts in this reach. Burns Creek enters the Green River around the upstream end of the Loans Levee at the very upstream end of this segment. (Green River, Unincorporated)	N	<p><b>Horath-Kaech Levee Setback and Floodplain Reconnection at RM 35.1 to 35.6:</b> Relocate deteriorating levee to edge of agricultural area, restore side-channel connection, channel migration, aquatic edge, floodplain wetlands, and riparian habitat. (Green River, Unincorporated)</p> <p><b>Hamakami Levee Setback at RM 35.8 to 36.1:</b> Relocate deteriorating levee to edge of agricultural terrace, restore side-channel connection, channel migration, aquatic edge, floodplain wetlands, and riparian habitat. (Green River, Unincorporated)</p> <p><b>Turley Levee Setback at RM 37.2 to 37.5:</b> Relocate deteriorating levee to edge of agricultural terrace, restore side-channel connection, channel migration, aquatic edge, floodplain wetlands, and riparian habitat. (Green River, Unincorporated)</p> <p><b>Lone's Levee Setback at RM 38.0 to 38.2:</b> Relocate deteriorating levee to edge of agricultural terrace, restore side-channel connection, channel migration, aquatic edge, floodplain wetlands, and riparian habitat. (Green River, Unincorporated)</p>



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
35.12	35.6	L	<b>Neely /Pre-1959:</b> A continuation of the Neely Levee follows the riverbank upstream from the Neely Bridge along the former alignment of the Green Valley Road, closely bordered by a farmhouse and numerous outbuildings, until it reaches a former bridge crossing location at RM 35.3. An older training levee or revetment structure, called “Pre-1959,” also continues upstream from there to a gas line crossing near RM 35.5. It appears this structure used to extend upstream past the gas line right-of-way, but the bank here is highly unstable, and any previous structure is long gone. Two small cleared fields or pastures are located just landward of this old structure, along the toe of the adjacent steep hillside. Immature riparian deciduous vegetation has taken root in the levee rip-rap in this reach, forming a narrow band of surprisingly robust growth. Otherwise the buffer area is absent, with the cleared fields and tightly clustered farm structures present immediately adjacent to the levee access road. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
35.6	40.8	L	<b>Green River Waterway /O’Grady Park:</b> The entire left bank of the river here is largely in public ownership as open space, including the heavily forested valley wall and both vegetated and active gravel bars along the channel. Though some older clearings are present, nearly this entire reach is one continuous intact riparian buffer. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
38.2	40.06	R	<b>Naglich / Cooke (Kruger) / Metzler-O’Grady:</b> Two single-family homes occupy the severe channel migration hazard area within the 100-year floodplain at the downstream end of this segment. Both are at risk due to channel migration and safe access is severely impaired during flood events. The balance of this reach constitutes the right bank portions of King County Metzler-O’Grady Park and supports dense riparian forest, active and vegetated mid-channel and point bar formations and the most abundant, natural large woody debris accumulations downstream from the Flaming Geyser Gorge. (Green River, Unincorporated)	Y	<b>Middle Green Floodplain Acquisition:</b> Purchase and remove the single-family home, remove site fills, and replant native riparian trees and shrubs. This project should be integrated with levee setback and Natural Area habitat restoration initiatives throughout the adjacent reaches, both upstream and downstream, and at the mouth of Burns Creek. (Green River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
40.06	41.90	R	<b>Meyer Dike / Imhoff / Whitney Bridge:</b> Two older, unmaintained facilities are located near the middle of this reach, which supports several active and vegetated mid-channel bars and side channels in places. The upstream end includes a portion of the County Park at Whitney Bridge, where the floodplain area has been replanted with native riparian trees and shrubs. The middle and downstream end of this segment border small farms and large-lot single family homes. Crisp Creek flows landward of these homes along the margins of the Green Valley Road to the North of these homes. Homeowners in this low-lying floodplain have previously expressed concerns about intermittent landslides into the adjacent river from a steep cliff area just across the channel from their river frontage. Any major landslide that might occur here could easily re-direct flows right through this neighborhood. It is likely that under this scenario a new channel would be cut in the present location of Crisp Creek. Even though this may be considered a very rare event with therefore only a small probability of occurrence, the hazards associated with any such occurrence would be severe to say the least. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
40.8	41.1	L	<b>Landslide Potential Reach:</b> Though part of the same open space area as described just downstream, this segment is separately described because the river along the left bank flows right along the base of a steep, nearly vertical hillside that has previously produced small scale landslides directly into the river channel. A major slide here is certainly possible, and would block the existing mainstem channel, similar to what occurred in the Elliot Reach of the Cedar River during a large earthquake. At this Green River location, this slide event would re-route the flows directly through a large-lot residential area immediately across the river, likely causing extensive property damage and posing a safety threat to residents. (Green River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
41.1	42.6	L	<p><b>Newaukum Creek /Green River Waterway /Whitney Bridge / “Soapstone”:</b> The Newaukum Creek confluence is at the downstream end of this segment, forming a small, densely wooded ravine. The center of this segment is bisected by the Whitney Bridge, with agricultural pastures and farmhouses, barns, and outbuildings extending both upstream and downstream. The upstream end of this reach is defined by a bedrock outcropping incorrectly known to local inhabitants as “soapstone.” It is more properly identified as a soft, easily weathered Miocene siltstone unit, associated with coal deposits, formerly mined just across the river. In either case, it forms a relatively solid boundary to the channel, defining a relatively sharp bend in the process. There is generally a narrow band of somewhat immature tree cover growing right on the bank in this reach, with cleared pastures generally close to the bank. Local groves of trees are also present, especially downstream of Whitney Bridge. Elsewhere, no functional buffer area is present. There does not appear to be any flood containment facility or revetment in this reach, though older farming activity may have constructed some, now covered with trees and brush. Floodwaters do not appear to overtop the banks, as this reach is relatively straight, steep, and somewhat incised. Gravel bars are present, as are two prominent vegetated mid-channel bars downstream from the bridge, which recruit large woody debris deposits from time to time. (Green River, Unincorporated)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
41.90	42.48	R	<b>Whitney Bridge /Green Valley Road Protection:</b> This short segment extends upstream from Whitney Bridge past another portion of the replanted County Park property to the gravel shoulder along Green Valley Road. The bank here is steep, armored with rip-rap, and unstable. Flows are relatively high velocity and strike the road embankment at a sharp angle, with erosion present. Vegetation here is patchy, but downstream portions within the Park have good cover along the steep, boulder-strewn riverbank. The sole remaining exception is right at Whitney bridge, where a gravel access road allows vehicles to park within the channel on the gravel bar during low-water periods. (Green River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
42.48	45.20	R	<p><b>Flaming Geyser:</b> Three large meander bends characterize this reach adjacent to Flaming Geyser State Park. At the downstream end, near the entrance to the Park, an inside meander bend occupies floodplain areas historically modified with placement of overburden and mine spoils from old mines previously located just across the Green Valley Road. These areas are heavily vegetated at present with mature riparian forest cover. Banks are rather steep, and blackberries are locally present. A vegetated mid-channel bar is located right at the bridge defining the park entry, with an additional bar just upstream. The mid-portions of this reach are located along an outer meander bend where the river cuts into the base of a cliff developed in an exposure of Miocene sand-and-siltstone formations. Other portions of this bend flow along the base of a steeply forested hill slope which may be associated with potential landslides into the river. Such events in this location could affect the State Park, but little else. Just past this hillside, on the downstream end of the final broadly developed inside meander bend defining this reach are several older farm structures associated with the Park. Older cleared pasture areas are also present here. The floodplain portions of this meander bend have become relatively isolated from the river following activation of flow controls at Howard Hanson Dam in 1961, but older side-channels are still present. Active gravel bar formation and channel braiding are also present in the mainstem channel near the mid-point of this bend. Older floodplain areas which are not managed as abandoned pasture by the Park support densely vegetated, mature riparian forest cover. The upper end of this reach is defined by the mouth of the Green River Gorge, which extends upstream. (Green River, Unincorporated)</p>	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
42.6	43.1	L	<b>Flaming Geyser Landslide:</b> The river here forms a wide outer bend along the base of a steep, wooded hillside at the downstream end of Flaming Geyser State Park. The center of this segment is occupied by a really spectacular landslide, covering perhaps three acres of hillside. Sediments from this slide are periodically released into the river, including a great deal of fine sediments which may impact spawning gravel quality and salmonid survival downstream. The slide mass is large enough, and active enough, that a complete blockage of the existing channel is quite possible. If this were to occur, the river would likely cut a new course through wooded, undeveloped parklands on the meander bend directly across the current channel from the slide location. The river is relatively steep and fast in this reach, so substantial reworking of any slide deposits should also be anticipated. (Green River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
43.1	45.0	L	<b>Flaming Geyser:</b> Much of the riverbank within the State Park is covered with old rip-rap armored revetments, including portions along the road shoulder entering the picnic area. These revetments are steep, toe structure is questionable throughout, and local evidence of erosion and rip-rap dislocation is visible. Bank cover varies from blackberries to some willows and occasionally denser cover with deciduous trees. Active gravel bar areas and side channels are present in the picnic area itself, with cleared access down to the riverbank in several locations. King County has previously constructed two small erosion repairs within the park, using log structures and planting. Old pasture areas near the Park entry do not provide functional vegetative buffer areas along the river. Flood flows occupy low grounds during peak flow events, but generally floodwaters do not overtop large portions of the site. The channel is formed in coarse gravels, cobbles, and boulders, showing the steep channel gradient and relatively rapid flow velocities present. The upstream end of this reach terminates at the mouth of the Green River Gorge, where this widens into the historic floodplain of the Middle Green River. (Green River, Unincorporated)	N	Feasibility and technical analysis required.
30.35	31.09	R	<b>Pig Farm / Porter Bridge:</b> A large meander bend is covered with single-family homes through upstream portions of this segment, and by open space lands vegetated with mature cotton groves and other native riparian forest cover. The Porter Bridge Levee at the upstream end is discontinuous, with homes built right down to the base flood elevation in the middle portions of this segment. Some tree cover is present along the Porter Bridge Levee and several downstream properties, but extensive clearing down to the channel edge is also present along residential back yards that border this segment. (Green River, Unincorporated, City of Auburn)	N	Feasibility and technical analysis required.

**Vashon Island (WRIA 15)**

<b>DS RM</b>	<b>US RM</b>	<b>Bank</b>	<b>Flood or Channel Migration Risk</b>	<b>In Action Plan?</b>	<b>Proposed Project</b>
N/A	N/A	N/A	<b>Parcel Number 0823039006:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Vashon Island, Unincorporated)	Y	<b>Vashon Island Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Vashon Island, Unincorporated)
N/A	N/A	N/A	<b>Parcel Number 0823039033:</b> This existing home has repeatedly experienced damage from flood events in King County. Repetitive damage to this structure was determined by FEMA based on existence of a flood insurance policy and claims paid by that policy. Based on the amount and number of claims that have been paid, this property is identified as being at high risk for future flood damage. (Vashon Island, Unincorporated)	Y	<b>Vashon Island Early Action Residential Flood Hazard Mitigation:</b> Purchase and remove structure, or otherwise mitigate flood risks to repetitive loss properties. (Vashon Island, Unincorporated)



**White River, Greenwater River and Red Creek (WRIA 10)**

<b>DS RM</b>	<b>US RM</b>	<b>Bank</b>	<b>Flood or Channel Migration Risk</b>	<b>In Action Plan?</b>	<b>Proposed Project</b>
TBD	29.6	TBD	<b>White River Channel Migration Zone:</b> Channel migration is a type of flood hazard. King County maps channel migration zones to identify the extent of this flood hazard and regulate land use in the affected areas. Historical and recent evidence indicates that this part of the White River is subject to channel migration. A White River channel migration zone study and map will be completed under this project for use by the King County Dept of Development and Environmental Services in land use regulation within King County. (White River, Unincorporated and Incorporated)	Y	<b>White River Channel Migration Zone Study and Mapping:</b> Prepare Channel migration zone study and maps for the White River. (White River, Unincorporated and Incorporated)
N/A	N/A	L, R	<b>White River Flood Study:</b> The entirety of the White River within King County is in need of a flood study. Pierce County recently updated the lowermost reach below River Mile 5. The existing flood study within the King County portions of the White River used cross-section data collected from 1974. Because the White River is a sediment-rich system with deposition occurring in the lower reaches, it is highly unlikely that the existing flood study is representative of current day hazards. The location of the channel is different in some areas from what the existing flood mapping shows, and there are large areas of the floodplain for which flood mapping has yet to be completed. For example, at least one home in the Red Creek area is in the direct path of high-velocity flood flows but is not in an area mapped as such. The Flood Insurance Rate Map also is inaccurate in that it shows Red Creek entering the White River upstream of where it actually does. These inaccuracies do not allow for appropriate floodplain regulation in these areas. (White River, City of Pacific, City of Auburn, Muckleshoot Indian Tribe, Unincorporated)	Y	<b>White River Flood Study:</b> Prepare flood study and corresponding FEMA Flood Insurance Studies and Flood Insurance Rate Maps for the White River. (White River, City of Pacific, City of Auburn, Muckleshoot Indian Tribe, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.4	5.5	R	<b>White River Estates (Pacific) along White River Drive flooding and channel migration:</b> Thirty-one homes are within the currently mapped 100-year floodplain, and four homes are adjacent or within the area of historic channel locations of the White River. It is unknown if any of these homes have ever flooded. The Pacific Park levee is well-vegetated with some mature cottonwoods. There is no evidence of scour, however, the composition of the levee materials is unknown and the riprap that is visible is sporadic. Overtime, these homes could be threatened by channel erosion or could experienced inundation in a major flood event. Overbank flooding and surface erosion of the levee occurred in January 2006. (White River, City of Pacific)	N	Feasibility and technical analysis required.
5.50	6.20	L, R	<b>County-line to A-Street channel constriction:</b> Flows in this reach are constricted by reveted banks and are contained by the left bank levee downstream of the A-Street and BNRR bridges. Currently, the active channel is disconnected from its floodplain by the left bank levee, prohibiting the deposition of sediments and flood waters onto the left, undeveloped, overbank. Flood flows are directed to the right bank revetment, where residential development is located along the top of the riverbank. During the 1995/96, and again in 2006, the lower end of the left bank flood protection facility near the county-line was flooded, connecting river and wetland flows. The White River carries a high sediment load and this reach is a depositional area. River gravels in this area and the downstream reaches had been dredged periodically prior to the mid-1980. Severe flood conditions combined with increased deposition could exacerbate flood flow impingement into right bank, resulting in damage to the Pacific City Park concrete revetment and the adjacent residential community. Also, the left bank levee could fail, resulting in flood flows entering the left overbank floodplain. (White River, City of Pacific)	Y	<b>County Line to A-Street Flood Conveyance Improvement:</b> Acquire remaining private property via fee simple or flood easement purchase to implement this levee modification project. Conduct a floodplain hydraulic analysis and determine current-day base flood elevations to verify the extent of potential flood risk to the right bank residential and park developments. Complete channel migration zone mapping to determine the extent of potential erosion risk. Reconnect the active channel to its left overbank floodplain by breaching the Union Pacific levee, allowing for improved flood flow conveyance into the existing floodplain area and for the restoration of river channel processes through the reach. Replace existing concrete culvert with shallow box culvert for flow reentry into the river channel within Pierce County. This project is also a recommended WRIA-10 habitat recovery project. (White River, City of Pacific)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
5.80	6.20	R	<b>Pacific City Park damaged revetment and degraded riparian buffer:</b> Flows are constricted by concrete revetments on both banks. On the right bank is the city's park with active recreational uses. The park was built over an old county landfill. No riparian buffer exists due to the revetment and the high use by park users. A small length of the concrete revetment at the upstream end of the park is broken and undermined along the ordinary high water line. This portion of the revetment is on the outside of the meander and there is the potential for further erosion, which will cause increased amount of damaged area if not repaired. Where broken, the damaged revetment presents a hazard to park users accessing the water. The park area is nearly all within the 100-year floodplain with nearly half of the downstream portion of the park area within the area of historic active channel locations. (White River, City of Pacific)	Y	<b>Pacific City Park Revetment Repair:</b> Repair a small portion of the existing damaged revetment. Remove portions of the concrete revetment. Place a log and rock toe below the ordinary high water line and re-stabilize the bank face using bioengineering techniques. Revegetate the upper bank and the top of bank area of project site with native trees and shrubs. Conduct project scoping in 2005 with design/permits in 2006 and construction in 2007. (White River, City of Pacific)
6.2	6.4	R	<b>3rd Place Mobile Home Court Blocked Access and Degraded Buffer:</b> A mobile home court is immediately adjoining the top of the degraded concrete revetment. Manufactured homes are in very close proximity to flood waters and homeowners have encroached into the 20 ft wide river protection easement area. Channel constriction in this reach and the location of the homes on the outside of a meander create the potential for flooding to impact these residences. No equipment access along the top of the revetment is available due to the position of the homes on the bank. No riparian buffer exists due to the concrete revetment and the riverside residences. Sixteen mobile homes are within the area of the historic active channel location. (White River, City of Pacific)	Y	<b>3<sup>rd</sup> Place and Pacific City Park Revetment Retrofit:</b> Notify homeowners about the established easement and provide flood preparedness information. Develop revetment retrofit design to remove degraded concrete slabs, and install a benched, biostabilize riverbank from A-Street and BNSF Railway bridges down to the existing vegetated bank at the downstream end of the city park. Remove homes located between the top of bank and 3rd Place SE; re-establish and connect riparian buffer with the adjacent, similar buffer restoration along the city park. See also Pacific City Park Revetment Repair. (White River, City of Pacific)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.40	6.45	R	<b>A Street bridge overbank flooding:</b> Overbank flooding at the right bank revetment near the upstream side of A Street bridge is indicated based upon the existing flood map information. About seven manufactured homes are within the area of mapped flooding. Some shallow backwater flooding has been observed. Also, these homes are on an aging community septic system. (White River, City of Pacific)	N	Feasibility and technical analysis required.
6.40	6.60	L	<b>A-Street Bridge Channel Constriction:</b> The channel is constricted by reveted banks that narrow the flow area into and through the bridge opening. Buffers are degraded, resulting in a lack of cohesive vegetation which may reduce erosion protection on the bank face and overbank areas. (White River, City of Auburn)	N	Feasibility and technical analysis required.
6.70	7.20	L	<b>Roegner Park and Riverside School Bank Erosion and Channel Migration:</b> The former floodplain area has been filled, reducing conveyance through this reach. The river bank is over steepened and is composed of unconsolidated materials and some rubble. A high school and city park were constructed on the fill material and lie within the location of historic active channels. The river bank has an eroded face with a degraded buffer composed mainly of invasive plants. This riverbank is unprotected and prone to erosion, and potentially channel migration, that could threatened the city park, trail, high school and wastewater pump station and its under channel main pipelines and a water supply line. (White River, City of Auburn)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
6.40	7.00	R	<b>White River Estates (Auburn) Mobile Home Park Channel Migration and Degraded Riparian Buffer:</b> The revetment along this reach is over steepened with an inconsistent amount of rock armor on its face and along the toe of the bank. Large cottonwoods have grown-in along the top of the bank but many have reached their maturity. Some have been weakened or dropped by beavers. Landowners viewed the mature cottonwoods as a hazard. There is a lack of under story shrubs or younger-aged trees to biostabilize the revetment. The revetment is susceptible to bank face scour. Most mobile homes appear to be on higher ground, set back from the top edge of the bank and appear not to be prone to flood inundation, however, the riverward row of homes is within the historic active channel location. Property loss could occur from scour and lateral migration of the channel. Also, undermining of the mature trees could exacerbate localized bank erosion. (White River, City of Auburn)	N	Feasibility and technical analysis required.
7.0	7.7	R	<b>41<sup>st</sup> Street Channel Migration:</b> The river channel is directed toward the right bank by the valley wall projecting from the southerly, left bank. Given this physical feature, the river and flood flows have the potential for lateral migration into the right bank which contains the City of Auburn's Mt. Baker Junior High School, sixteen single-family residences, a multi-family development and 41st Street - a private road. The existing revetment is composed of sporadically-placed concrete rubble and has some minimal vegetation, mainly a single line of maturing cottonwoods with no under story shrubs or saplings. The composition of the revetment materials underneath the concrete rubble is unknown, adding to the uncertainty of the structural integrity to provide erosion protection. (White River, City of Auburn)	Y	<b>41<sup>st</sup> Street Setback Feasibility Analysis and Design:</b> Conduct a feasibility analysis and develop the design for a set back of the existing reveted river bank. Verify if a flood easement exists for the flood protection facility. Conduct a field investigation to determine the revetment materials, assess the revetment for its level of erosion protection and measure the available landward area that could accommodate a set back while maintaining an adequate width for the private road. Develop a project design that can be used to discuss the proposed set back with the private landowner and the school district. With landowner support, modify the flood protection facility by setting it back farther from the active river channel. (White River, City of Auburn)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.70	8.00	R	<b>Ballard Park Channel Migration and Limited Access:</b> Upstream of City of Auburn's Ballard Park, fifteen homes lie within the historic active channel area along the right bank. The high bank revetment is composed of sporadically-placed rock and some large, mature vegetation. There is not any apparent evidence of recent bank erosion. Equipment access to the toe to slope of the county revetment is limited in the area riverward of the houses. The current access is via a cul-de-sac and locked gate onto an unpaved grass surface. The lock is not a county lock. Without proper access, the ability to make emergency repairs is limited. (White River, Auburn)	N	Feasibility and technical analysis required.
7.20	7.60		<b>Oravetz Road and Auburn Trail Channel Migration:</b> Oravetz Road and the City of Auburn's trail are tightly positioned in the riparian area between the edge of the river channel and a protruding ridge of valley wall. The road and trail lie within the footprint of the historic active channels and are likely within the channel migration area. Overtime, the channel may shift into the left bank revetment, threatening the trail and the road embankments. (White River, City of Auburn)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
7.60	8.20	L	<b>R Street Bridge and Stuck River Drive Channel Migration and Degraded Buffer:</b> The historic active channel area extends about 500 feet landward of the current channel position, and indicates an erosion potential that would threaten the R Street bridge, Stuck River Drive, the City of Auburn's trail and a portion of a private sand and gravel quarry. Concrete debris and rumble exists along portions of the over steepened river bank. A short length of bank along this reach near the R Street bridge was improved as part of a City of Auburn trail project which goes under the R Street bridge. The trail lies along the top of bank adjacent to Stuck River Drive and connects the city's Roeger Park with the Wilderness Park. The trail and roadway have eliminated the top of back area necessary to establish a riparian buffer. Only the bank face with a limited top edge of bank serves as the riparian area along the half-mile reach upstream of the bridge. On the opposite bank, the channel is constricted by the downstream end of the Auburn Wall which is the former flow path of the White River pre-1906. (White River, City of Auburn)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
8.2	10.7	L	<p><b>Left Bank TransCanada Levee Breaches and Overflow into Wilderness Park:</b> The TransCanada levee located immediately upstream of the City of Auburn's Wilderness Park, extends into within the Muckelshoot Indian Tribe Reservation up to the Williams Natural Gas Pipeline crossing at RM 10.7. The levee forces the river channel into the northerly bluff of the valley wall. The levee was breached in the 1975 flood event and has experienced additional erosion in subsequent flood events occurring in 1990 and 1995/96. Flood waters now can reoccupy some of the historic floodplain channels that were cutoff from the active channel when the levee was constructed. A portion of the flow paths is illustrated in the existing FEMA flood hazard mapping from the westerly portion of the Muckelshoot Indian Tribe Reservation boundary line. Although breached, much of the levee prism remains, constricting portions of the river reach and continuing to force flows into the toe of slope of the right bank valley wall. The overbank flows spread out and travel downstream into the Wilderness Park area where they funnel into an off-channel to reenter the river through a previously return-flow breached area of the levee. The City has constructed the trail over a return-flow breach in the levee and placed two 12-inch culverts although the off-channel is a quite large trapezoidal flow path with at least a 15 ft bottom width. Overbank flows are expected to continue to enter this off-channel path and may overwhelm the dual-culvert capacity, potentially resulting in damage to the trail embankment and the adjoining trail paths and park land, or both. (White River, City of Auburn, Muckleshoot Indian Tribe)</p>	Y	<p><b>TransCanada Flood Conveyance Improvement:</b> Acquire the off-channel floodplain portions of the adjoining undeveloped private parcels and modify the breached portions of the levee to improve flood flow conveyance in the overbank areas of the floodplain. Use existing cross-section data and map the breach locations with GPS to initially determine the extent of the existing overbank flow paths. Conduct a project feasibility analysis by developing a hydraulic model and performing a geomorphic assessment of the levee, the breach locations and flow paths. Develop a new trail alignment that eliminates the need for an off-channel crossing. If the trail alignment is not feasible, assess the culvert capacity and replace the culverts to accommodate the expected overbank flow. Enhancing off-channel habitat along this area is a WRIA-10 habitat recovery plan proposal. (White River, City of Auburn, Muckleshoot Indian Tribe)</p>



DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
22.40	22.45		<b>SR 410 Bridge at Enumclaw Potential Scour:</b> The SR 410 bridge lies within the historic active channels area indicating some potential for exposure to erosive flows and channel migration. Overtime, the flow constriction through this bridge may result in abutment scour. The channel is constricted by the bridge; however, no known significant scour problems are evident at this time. (White River, Unincorporated)	N	Feasibility and technical analysis required.
22.50	22.60	L, R	<b>Tacoma Pipeline:</b> No current day problem, but property managed for flooding and channel migration by the River and Floodplain Management Program needs to be monitored for TPU revegetation mitigation and illegal dumping and weed control. (White River, Unincorporated)	N	Feasibility and technical analysis required.
23.90	24.10	R	<b>Hatchery Levee Potential Overtopping:</b> The river flows directly into the north valley wall bluff and impinges perpendicularly into this rock levee built in 1974. The county maintenance file indicates repetitive maintenance at this site, called the Kahne flood protection facility, prior to the 1990's. The upstream end of the flood protection facility protects the toe of the bluff upon which lies Mud Mountain Road. The downstream end is now the Hatchery Levee, not a county flood protection facility, that levee protects the upper portion of the White River Fish hatchery property. During the 1995/96 flood event, an emergency sandbag effort was conducted to block off flows that threatened to overtop the levee. An existing wall base channel and historic floodplain channel lie in the right overbank, landward of the hatchery levee. (White River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
25.7	27.1	R	<b>Red Creek Channel Migration and Overbank Flood Hazards:</b> This area is located just two river miles downstream of the Mud Mountain Dam. The river along this reach experiences periodic and rapid river channel migration. In addition, deep fast flows occur in various paths in the right bank floodplain. The extent of inundation and bank erosion can quickly change, and threatens several existing residential structures. The Red Creek channel and its confluence are overwhelmed by White River flood flows along this 1.25 mile reach. One home (PIN 9011) is surrounded by a multiple channel flow paths in the floodplain; another home (PIN 9023) is immediately adjacent to the mainstem and within the riparian buffer area; a third home (PIN 9053) is on a low terrace of floodplain, but is in the direct flow path of the right bank mainstem meander; two other homes (PIN 9088 and PIN 9087) are positioned on a somewhat higher terrace and may not be directly affected by current-day flood flows but may lie within a channel migration hazard area and could be at-risk in the future. (White River and Red Creek, Unincorporated)	Y	<b>Red Creek Acquisitions:</b> In this high hazard area, at-risk residential homes should be acquired and removed. Disturbed land areas from removal of structures should be restored to a natural grade and replanting with native plants. Future development should be prohibited from flood and channel migration hazard zones. A floodplain analysis should be completed to determine current-day base flood elevations to verify extent of potential flood hazard areas. A channel migration study and mapping should be completed to determine the extent of potential erosion risk. Outreach to landowners is needed to provide information about the existing flood and erosion hazards and to assess the willingness of current landowners to sell at-risk homes. (White River and Red Creek, Unincorporated)
45.60	45.65	R	<b>Slippery Creek Bridge Flow Blockage:</b> The abandoned concrete highway bridge the crosses Slippery Creek lies remains in place but the 1995 and 1996 flood events destroyed the commercial building on the right bank of Slippery Creek on the upstream side of the bridge. The old bridge is an obstacle, causing sediment and debris to block the bridge's small clearance area and potentially directing flood flows onto SR 410. Also, the mainstem of the White River is immediately adjacent to SR 410. (White River, Unincorporated)	N	Feasibility and technical analysis required.

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
39.00	45.80	R	<b>SR410 Channel Encroachment:</b> The road alignment of SR410 encroaches into the channel and floodplain area of the White River in several locations along this reach above Mud Mountain Dam. Protection measures, (i.e. rock riprap) have been implemented by Washington State Department of Transportation following major flood events, most recently in 1995 and 1996. The rock placement impacts channel habitat and is not a permanently solution to the actively migrating channel. (White River, Unincorporated)	N	Feasibility and technical analysis required.
entire	entire	L, R	<b>Greenwater River Flood Study:</b> This is a major tributary to the White River. The Greenwater River has only an approximate flood zone defined, which provides no information on flood elevations or a delineated floodway. A detailed flood study is needed along the lowermost portion of the river where a riverside residential community is located. (Greenwater River, Unincorporated)	Y	<b>Greenwater River Flood Study:</b> Prepare flood study and corresponding FEMA Flood Insurance Studies and Flood Insurance Rate Maps for the Greenwater River. (Greenwater River, Unincorporated)
45.85	45.9	R	<b>White and Greenwater Residential Flooding:</b> On the right bank of the White River at its confluence with the Greenwater River is a residential complex of private home and rental apartments that has experienced significant flooding and damages in the 1995 flood event. The White River channel eroded into the right bank, allowing flood waters to pass through the property and three structures. The home owner obtained a small business loan (\$130,000) to make repairs and construct a flood wall of concrete “ecology blocks” along the river bank. The residential site remains vulnerable to the highly erosive flows along this reach which could undermine the flood wall. Also, the site could be flooded from the Greenwater River if the SR410 bridge pier accumulates significant debris and results in flood waters overtopping the highway. See SR 410 Bridge Debris Blockage. (White and Greenwater River, Unincorporated)	Y	<b>White-Greenwater Acquisition:</b> Acquire the property and remove the at-risk residential and rental structures. Remove the concrete flood wall and restore the riverbank to a natural floodplain condition. (White and Greenwater River, Unincorporated)

DS RM	US RM	Bank	Flood or Channel Migration Risk	In Action Plan?	Proposed Project
0.05	0.10	L, R	<b>SR410 Bridge Debris Blockage:</b> The SR 410 bridge has a center pier which has repeatedly accumulated log jams. In the flood of record in 1977, the debris blockage at the bridge caused a backwater condition that flooded and damaged buildings in the Greenwater community. Some maintenance work has been completed by Washington State Department of Transportation to place a concrete scour pad around the channel and the center pier, however, debris accumulation during flood events is still likely and could cause flooding of SR410 and the adjacent commercial and residential structures. Although the scour pad protects the pier from being undermined, pool habitat in the bridge area was eliminated. (Greenwater River, Unincorporated)	N	Feasibility and technical analysis required.
0.4	0.8	R	<b>Greenwater Residential Flooding:</b> Twenty-eight lots exist along the right bank, many with summer cabins and some as year-round homes. Flood flows in 1979 resulting in significant bank erosion and overbank flows passed behind many of the structures. The revetment was improved following the 1979 event. It is unknown when the original revetment was constructed. Based upon field inspections in recent years, there is no evidence of scour affecting the current condition of the revetment, however, flood flows may overtop the riverbank and inundate the existing homes. Shallow overtopping occurred in 1990 and 1995. (Greenwater River, Unincorporated)	N	Feasibility and technical analysis required.